
Missouri Registry Annual Report

Registry of Confirmed Abandoned or Uncontrolled
Hazardous Waste Disposal Sites in Missouri
and
Hazardous Waste Remedial Fund Statement

Fiscal Year 2002



**Missouri Department of Natural Resources
Air and Land Protection Division
Hazardous Waste Program**

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and
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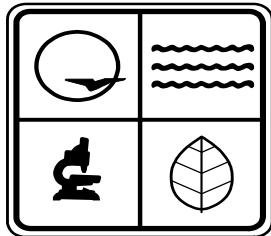
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Missouri Department of Natural Resources

Missouri Registry Annual Report

INTRODUCTION

In 1980, the United States Congress established the Comprehensive Environmental Response, Compensation and Liability Act, better known as CERCLA or "Superfund." This law was passed to respond to the indiscriminate disposal of the byproducts of industrial life, which contaminated soil and water and resulted in threats to public health and the environment. The federal statute provided both response and funding mechanisms for the cleanup of hazardous substance disposal sites.

In June 1983, the Missouri legislature passed a state law to address these issues. The law directed the Missouri Department of Natural Resources to prepare a Registry of Confirmed Abandoned or Uncontrolled Hazardous Waste Disposal Sites in Missouri (Registry). The law also authorized the establishment of emergency response activities to respond to hazardous substance releases; created a Hazardous Waste Remedial Fund for the implementation of these programs and other expenditures, such as financing the non-federal share of cleanups and the investigation and assessment of potential hazardous waste sites; and required that, each January, a full account of the Hazardous Waste Remedial Fund be reported.

This annual report is published to comply with statutory obligations (Section 260.445 RSMo 1986, Missouri Hazardous Waste Management Law, see Appendix C). Missouri law requires the department to transmit a report each January 1 to the General Assembly and Governor regarding sites listed on the Registry. The statute also requires the report be provided to the Missouri Hazardous Waste Management Commission and the governing body of each county containing a Registry site.

In a broader sense, this report also provides an understanding of how the state and federal hazardous waste programs work together to provide financial, legal and technical aid for hazardous substance responses and cleanups in the state of Missouri.

STATE SUPERFUND ACTIVITIES

REGISTRY OF CONFIRMED ABANDONED OR UNCONTROLLED HAZARDOUS WASTE DISPOSAL SITES IN MISSOURI (REGISTRY)

The Registry operates as a set of institutional controls for sites that contain hazardous waste. By law and regulation, it provides for: deed notification of contamination, annual inspection, notice to buyer, change of use review, notice to the state if property is sold, cleanup and removal from the Registry, and public information about site location, classification of threat, contaminants, health concerns, public and private drinking water wells, and geology.

In addition, the information in the Registry informs the public about property on the Registry and associated hazards and informs potential buyers about hazards and legal obligations that they may undertake if they purchase such property.

As defined in Hazardous Waste Management Law, RSMo Sections 260.350 to 260.430, the Registry is not intended or legally permitted to provide a comprehensive inventory of sites where hazardous chemicals and wastes have been disposed in Missouri. Instead, it is developed based on a specific legal mandate, which directs that sites are listed on the Registry if they are contaminated with hazardous wastes that:

1. Meet the legal definition of hazardous waste according to federal statute, the Resource Conservation and Recovery Act of 1983 (RCRA). A waste is considered hazardous under RCRA if it meets either of the following criteria:
 - a. It is specifically listed or identified as a hazardous waste in the Code of Federal Regulations due to its composition and source, or
 - b. It exhibits one or more characteristics of a hazardous waste, which are ignitability, corrosivity, reactability or toxicity as determined by laboratory analysis.
2. Were disposed of before regulation of such waste began in 1983 or disposed of illegally since that time, and
3. Are present at concentrations above health-based screening levels.

Thousands of hazardous substances do not meet these stringent criteria or are exempted. Consequently, a large number of sites containing hazardous substances are not listed on the Missouri Registry. Examples of unlisted sites are:

- radioactive sites,
- sites contaminated with polychlorinated biphenyls (PCBs),
- sites contaminated with oil, gasoline or other “petroleum” materials (despite the composition of these materials that would indicate listed hazardous wastes, such as benzene, xylene or toluene),
- grain bins with pesticide contamination,
- certain former manufactured gas plant sites with coal tar residue,
- sites that have a chemical present in the groundwater but the department cannot determine how the chemical got there, such as solvents in groundwater where the source cannot be identified,
- fly ash waste,
- bottom ash waste,
- slag waste,
- flue gas emission control waste generated primarily from the combustion of coal or other fossil fuels,
- cement kiln dust waste, and
- solid waste from the extraction, beneficiation and processing of ores and minerals (mining waste).

Each site on the Registry is described in detail in this annual report (starting on page 51) and includes the following information:

1. a general description of the site, including the name and address, owner, and type and quantity of hazardous waste disposed there;
2. a summary of any significant environmental problems at and near the site; its proximity to private residences, public buildings or property, school facilities, places of work, or other areas where individuals may be present regularly;
3. a summary of any serious health problems in the immediate vicinity of the site and any health problems deemed by the department to be related to conditions at the site;
4. the status of any testing, monitoring or remedial actions in progress or recommended by the department; the status of any pending legal actions and any federal, state or local government permits; and the relative priority for remedial action at each site.

Within the department and the Missouri Department of Health and Senior Services (DHSS), a Site Assessment Committee has been formed to evaluate the sites on the Registry and to recommend cleanup priorities to the director of the department. The Site Assessment Committee is composed of representatives from the department's Hazardous Waste Program, Public Drinking Water Program, Environmental Services Program and Geological Survey and Resource Assessment Division. A fifth member represents the DHSS.

The members of the committee convene each fiscal year to analyze the sites for potential for fires and explosions and for groundwater, surface water, soil and air contamination. Members of the committee draw upon their own special expertise when assessing the site. For instance, the DHSS representative is responsible for identifying the possible effects of contamination at a site on human health. The committee invites EPA representatives to attend its meetings and to provide comments on sites where the EPA is the lead agency.

In the past year, the Site Assessment Committee reassessed sites in the fiscal year 2001 report and also assessed those sites placed on the Registry during fiscal 2002. Assessments are based upon the status of the site as of June 30, 2002, the end of the fiscal year, and take into account new information about a site or remedial measures taken to reduce potential risk. If conditions at a site have changed over the past fiscal year, the committee may recommend a change in classification that better defines the threat to human health and the environment.

According to state Registry law, the sites are placed in one of the following categories:

Class 1:	Sites that are causing or presenting an imminent danger of causing irreversible or irreparable damage to the public health or environment--immediate action required;
Class 2:	Sites that are a significant threat to the environment--action required;
Class 3:	Sites that do not present a significant threat to the public health or the environment--action may be deferred;
Class 4:	Sites that have been properly closed--require continued management;
Class 5:	Sites that have been properly closed with no evidence of present or potential adverse impact--no further action required. According to the state law, any site classified as a Class 5 is removed from the Registry.

The relative need for action at each site is based solely upon the potential impact on public health and the environment. The type of action required, the feasibility of such an action, and its cost or benefit are not the primary factors in deciding whether action is needed.

REGISTRY AND REGISTRY PROCEDURES

The department conducts investigations of potential abandoned or uncontrolled hazardous waste disposal sites and identifies those that should be placed on the Registry of Confirmed Abandoned or Uncontrolled Hazardous Waste Disposal Sites in Missouri (Registry). When the presence of

hazardous waste is confirmed at a site, the department notifies the owner or owners that it intends to place the property on the Registry. The notification is sent by certified mail to the owner's last known address 30 days before the site is to be listed on the Registry.

The owner or operator can appeal the proposed addition to the Registry, and no site may be listed on the Registry until the appeal is resolved. If an appeal cannot be resolved through negotiation, the Missouri Hazardous Waste Management Commission may convene a public hearing. At least 30 days before the hearing, a notice of the event is published in a newspaper in the same county as the site. All final decisions of the commission are reviewable under Chapter 536, RSMo.

If the owner does not want the entire property placed on the Registry, the listing may be limited to the contaminated portion of the property if the owner or operator submits a land survey performed by a licensed surveyor that includes the contaminated area plus a buffer zone in all directions. This allows the owner or operator unrestricted use of the portion of the property that is not contaminated.

If the owner is willing to remediate the site in order to avoid being listed on the Registry, the owner may negotiate a consent agreement. The consent agreement establishes a schedule and specific responsibilities for the completion of site investigation and remediation by the property owner or responsible party. All activities are completed with state oversight.

When a site is placed on the Registry, the history of the property as a hazardous waste disposal area is filed with the Recorder of Deeds. If a site is properly closed, with no evidence of a potentially adverse impact, this finding is also filed with the Recorder of Deeds. These actions notify any purchasers of the property that the site is or has been on the Registry.

Once a site is placed on the Registry, it is subject to certain restrictions. The use of the site may not change substantially without the written approval of the director of the department. Regulation 10 CSR 25-10.010 specifies that the change of use is substantial if it may result in the spread of contamination, increases human exposure to hazardous materials, increases adverse environmental impacts, or makes potential remedial actions to correct problems at the site more difficult. The seller must notify the buyer of the condition of the site prior to sale. Changes of ownership must be reported to the department within 30 days after the change.

In the event these restrictions are violated, or there is reason to believe they will be violated, the department may institute civil action in any court of competent jurisdiction. Decisions issued by the department's director regarding a change of use of a site may be appealed to the Missouri Hazardous Waste Management Commission.

Effective March 1, 1985, the Missouri Hazardous Waste Management Commission adopted regulation 10 CSR 25-10.010 pertaining to abandoned or uncontrolled hazardous waste disposal sites (see Appendix D). The regulation addresses the following topics:

- Placing sites on the Registry, petitions for deletion from the Registry, changes in site classification or modification of information;
- Appeals to the commission;
- Responsible party cleanups;
- Changes of use or transfers of site property; and
- Recording of sites placed on or removed from the Registry;

Additional information on the Registry and Registry procedures is available at the department's Internet address, www.dnr.state.mo.us, under hazardous waste topics.

EMERGENCY RESPONSE ACTIVITIES

During fiscal 2002, the department's Environmental Services Program, Environmental Emergency Response (EER) Section received a total of 3,402 calls reporting releases of hazardous substances. This number of incident reports is a 4.32 percent increase from the number of calls reported during fiscal 2001. EER staff responded on site to 398 of those reported incidents.

In fiscal 2002, petroleum products accounted for 28 percent of the incidents reported. Agricultural chemicals were involved in 1.3 percent of the incidents reported. Polychlorinated biphenyls accounted for 0.12 percent of the incidents, while sewage accounted for 3.0 percent of all calls received. Radiological substances were involved in only 0.18 percent of the calls received. Chemicals not included in the aforementioned categories accounted for 67.4 percent of the calls received. Principal among this final group are those chemicals associated with illicit drug labs. Reports of chemicals seized at clandestine drug labs accounted for 48.5 percent of all calls received. The number of drug lab related calls increased 29.6 percent over fiscal 2001. Other chemicals involved in releases to the environment include solvents and other organics, chlorine and other halogens, corrosives and other inorganics, waste tires, and solid wastes.

If an investigation of an incident reveals leakage to surface or groundwater, fumes that may affect the public, bulged containers, or other unstable conditions, the department may declare the situation a hazardous substance emergency. An on-scene coordinator from the department's Environmental Services Program, EER Section, will then determine what action is needed to stabilize the site or clean it up completely.

FEDERAL SUPERFUND ACTIVITIES IN COOPERATION WITH THE STATE

In December 1980, Congress enacted CERCLA, which was amended in 1986 by passage of the Superfund Amendments and Reauthorization Act (SARA). The law established a federal trust fund to finance cleanups and requires the EPA to identify and investigate sites where releases of hazardous substances into the environment might occur or have occurred in the past. The National Contingency Plan (40 CFR Part 300) is the basic policy directive for federal response actions under CERCLA.

Missouri is an integral part of the federal Superfund program. The department's roles and responsibilities include participating in the initial identification of hazardous waste sites, planning and implementing Superfund response activities, and sharing the cost for some response activities. Missouri's Superfund staff may either have a lead or a support role for actual cleanups, and responsibilities vary accordingly.

When the EPA takes primary responsibility for a response, the response is called an EPA-lead. In these cases, the state functions as the support agency. As a support agency, the state still retains some key responsibilities, but it does not assume the primary responsibility for the response.

Section 104(d)(1) of CERCLA/SARA states that the EPA may authorize a state to carry out a Superfund-financed response. These responses are defined as state-lead. For a state-lead response, the EPA takes on the secondary role and functions as the support agency, although the EPA retains responsibility for the remedy selection.

These federal and state roles and responsibilities for both EPA-lead and state-lead responses are formalized in cooperative agreements. Missouri has entered into several cooperative agreements with the EPA to investigate, manage and clean up Superfund sites.

FEDERAL FACILITY COOPERATIVE AGREEMENTS

Defense and State Memorandum of Agreement

Missouri, through the department, maintains an agreement with the Department of Defense that provides funding for the state's oversight of remedial actions at current and former military sites. Under this agreement, the state oversees the cleanup of two National Priorities List (NPL) sites: Lake City Army Ammunition Plant and Weldon Spring Ordnance Works. The agreement also provides for the state to oversee the study and cleanup of six active bases with minor to moderate areas of contamination, two installations that are slated for closing and reuse, and 21 formerly used defense installations.

United States Air Force

The department is assisting the Air Force in meeting the terms of the Strategic Arms Reduction Treaty (START) through a state attachment to a Federal Facility Compliance Agreement between the Air Force and the EPA. The 150 Minuteman II missile sites in Missouri have been dismantled pursuant to START, which resulted in some hazardous substances being buried on site. The state

was involved in overseeing the initial implosion activities and will oversee long-term groundwater monitoring at the missile sites.

Department of the Army

Missouri, through the department, maintains an agreement to provide oversight of the U.S. Army Corps of Engineers' Formerly Utilized Sites Remedial Action Program (FUSRAP) sites in the St. Louis area. FUSRAP addresses radiological and hazardous contamination generated as part of the Manhattan Project during development of the nation's atomic weapons in the 1940s and 1950s.

Department of Energy - Agreement in Principle

The department maintains an agreement for environmental oversight, monitoring and emergency response with the U.S. Department of Energy (DOE) - Kansas City Plant. The DOE Kansas City Plant produces non-nuclear components for nuclear weapons. Due to national security issues at the facility, this type of agreement is essential to provide the state and local stakeholders an independent assessment of environmental impacts occurring at the facility.

Department of Energy - Agreement in Support

Missouri, through the department, maintains an agreement to provide oversight of the U.S. Department of Energy's Weldon Spring Site Remedial Action Project (WSSRAP). The WSSRAP Site, located in the St. Louis metropolitan area west of St. Charles County, is addressing radiological and hazardous contamination generated during WW II and the nation's atomic weapons development in the 1950s and 1960s.

Missouri Air National Guard

The department will assist the Missouri Air National Guard located at Rosecrans Memorial Airport to meet cleanup objectives at areas not covered under the Defense and State Memorandum of Agreement. The department oversight is focused on soil cleanup during the parking ramp renovation.

National Imagery and Mapping Agency

The department will assist the National Imagery and Mapping Agency (formerly the Defense Mapping Agency), located in St. Louis, to meet cleanup objectives at areas not covered under the Defense and State Memorandum of Agreement. The department oversight is focused on environmental sampling investigations in support of a lease renewal with Scott Air Force Base and the disposal of excess property.

U.S. Environmental Protection Agency

The department is assisting the EPA in conducting preliminary investigations at federal facility sites. The investigations include field sampling, reports, and data reviews to determine responsibility and inclusion to the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS). Currently, 87 Formerly Used Defense sites are being considered for CERCLIS inclusion.

St. Louis Army Ammunition Plant

Under this agreement, the department will provide funding and support, through Redstone Arsenal, for environmental investigations in anticipation of a property transfer.

EPA/STATE COOPERATIVE AGREEMENTS

Superfund Consolidated Cooperative Agreement (SCCA)

The SCCA covers the following activities: Site Assessment (Preliminary Assessment/Site Inspection), Management Assistance, Core Program, and Brownfields Core Program. A total of \$2,117,822 was granted to the department to fund the Superfund activities listed on the next two pages.

Site Assessment Activities

Under the federal Superfund Law, the EPA established a Site Assessment program whereby the states can enter into cooperative agreements and assist the EPA in identifying and evaluating potential hazardous waste sites. These sites can then be addressed through CERCLA remedial or removal actions. In March 1985, the department made its first application to obtain CERCLA funding for these purposes. At that time the site assessment process allowed only Preliminary Assessments, Site Inspections and Expanded Site Inspections to evaluate sites for remedial action. Due to greater flexibility in the site assessment process, the department is now able to also conduct Desk Top Reviews, Pre-CERCLIS Site Screenings, Site Reassessments and Removal Assessments, plus it can further streamline the process by combining Preliminary Assessment/Site Inspections or integrating Removal Assessments into any investigation if needed.

During fiscal 2002, the department's Site Evaluation Unit of the Hazardous Waste Program completed 32 Desk Top Reviews, 22 Pre-CERCLIS Site Screenings, seven Preliminary Assessments, two Site Inspections, one Expanded Site Inspection, three Site Reassessments, and six Combined Preliminary Assessment/Site Inspections. The Site Evaluation Unit is working currently under the federal fiscal 2002 Consolidated Cooperative Agreement, which allocated \$830,489 for pre-remedial investigations.

Some of the more serious hazardous waste disposal sites identified and investigated through the Site Assessment program qualify for listing on the EPA's National Priorities List (NPL). NPL sites are eligible for funding from the federal trust fund, known as Superfund, for cleanup. Other sites assessed through the Site Assessment program have been cleaned up through the federal Superfund removal program, a Registry Consent Agreement, or the State Cooperative Program. Another cleanup option for sites in Missouri is the Hazardous Substance Environmental Remediation program, Missouri's Voluntary Cleanup Program (VCP). The VCP was established in 1994 for site owners who choose voluntarily to clean up their properties with state oversight. Also, as a result of the Site Assessment program, a number of confirmed abandoned or uncontrolled hazardous waste disposal sites have been identified and listed on the Registry.

Superfund Core Program Activities

Superfund activities are funded through the Core Program portion of the SCCA and include the overall implementation, coordination, training, community relations, site inventory and assessment, and administration of CERCLA, as amended by the SARA.

CERCLA authorizes states to receive fund monies for site-specific response through cooperative agreements; however, administrative expenses for state activities conducted under these agreements usually are limited. The Core Program portion of the SCCA provides the state of Missouri the opportunity to request funds for non-site-specific Superfund administrative activities. This enables the state to become involved in the Superfund process much sooner and in a much broader way. During fiscal 2002, the state of Missouri was provided \$633,638 in federal funds to cover Core Program activities under the current SCCA. A state match of \$63,364 was required to receive these federal funds.

Management Assistance Activities

The Management Assistance Cooperative Agreement (MACA) between the department and the EPA is included in the SCCA. The goal and purpose for this agreement is to improve overall program management and expedite both removal and remedial actions at federal-lead sites through improved state and federal coordination. The Superfund Section of the Hazardous Waste Program is responsible for implementation and management of the MACA. This multi-site MACA includes all active MACA sites except for Jasper County mining site activities, which are funded through a separate MACA.

MACA provides funds for certain tasks and activities that enable the state to provide support and assistance to the EPA. These support activities range from providing comments on Remedial Investigation/Feasibility Study reports to assisting in public meetings and briefings. There are 54 federal-lead sites located in the state that are included in the MACA. The MACA share of the SCCA is \$174,121.

State Enforcement Cooperative Agreement

The State Enforcement Cooperative Agreement authorized the SCCA in federal fiscal 2000 to partially fund work in Missouri's new Cooperative Program. The purpose of the agreement is to support the state's efforts to work cooperatively with responsible parties to investigate and clean up contaminated sites. The EPA provided the state with a total of \$101,651, primarily to pay for negotiations with responsible parties at sites that otherwise qualify for federal action. By allowing state staff to work directly on cleanups, this agreement increases overall efficiency and the number of sites cleaned up.

Brownfields Core Program Activities

A Brownfields Core Program has been included in the SCCA to provide the state with necessary funds to develop the state's Brownfields Program. This program is administered by the Voluntary Cleanup Section, which is separate both administratively and operationally from the Superfund Section. These funds were provided to facilitate the development, implementation, coordination, training, community relations, site assessment and administration of the Brownfields Program.

During fiscal 2002, the state of Missouri was provided \$351,936 in federal funds to cover Brownfields Core Program activities under the current SCCA. A state match of \$39,104 was required to receive these federal funds.

Bee Cee Manufacturing Cooperative Agreement

In 1999, the department entered into a cooperative agreement with the EPA that funds the department's participation in the remediation at the Bee Cee Manufacturing Site.

Funds allocated to the department under this cooperative agreement will be used to ensure that remediation of the site is completed. A state match of \$5,724 is required to receive federal funds, for a total of \$54,656. Please see page 181 for more detailed information on this site.

SUPERFUND RESPONSE PROCESS

The most serious of federal Superfund sites are placed on the National Priorities List (NPL). This list is maintained and updated by the EPA. Federal and state officials work together to determine priority sites and submit candidate sites for inclusion on the NPL. The NPL lists the sites with the highest priority for further investigation under federal Superfund. Candidate sites are ranked on a scale of 0 to 100, using a numerical scoring system known as the Hazard Ranking System (HRS).

The HRS evaluates the threat a site poses to human health or the environment through contamination of soil, surface water, groundwater or air. Hazardous waste sites with a quality-assured HRS score equal to or greater than 28.5 are eligible for inclusion on the NPL. Sites for which the Center for Disease Control has issued a health advisory are also eligible, regardless of the HRS score.

The National Contingency Plan (40 CFR Part 300) is the basic policy directive for federal response actions under CERCLA. It sets the procedures and standards for responding to releases of hazardous substances, pollutants and contaminants, and includes the HRS. Under SARA, the HRS has been revised by the EPA. This revision became final during federal fiscal 1991.

The HRS is the primary listing criterion for the vast majority of sites on the NPL. The initial identification for a site on the NPL is intended primarily to guide the EPA in determining which sites warrant further investigation because of public health and environmental risks.

When a site is placed on the NPL and the state manages the remedial response using federal Superfund monies, the state must enter into a cooperative agreement with the EPA for all phases of the remedial response. The cooperative agreement delineates the EPA and state responsibilities for remedial action at the site, for obtaining the required state assurances, and for committing the necessary funds to the remedial response. Missouri's share of total cleanup costs is 10 percent at privately owned sites, and 50 percent at publicly owned sites where the state or a political subdivision arranged for disposal of the hazardous substance.

A remedial response is a series of steps taken at a hazardous substance release site to effect a permanent remedy. It usually involves two types of activities: remedial planning and remedial implementation. Remedial planning generally includes investigation, preparation of a feasibility study, and development of a remedial design. Remedial implementation includes remedial actions taken at the site, as well as operation and maintenance.

During a Remedial Investigation (RI), data is gathered to characterize the nature and extent of contamination at the site. Information on potential remedial actions is also collected. Monitoring, sampling and analyses are often part of an RI.

The Feasibility Study (FS) uses the data generated by the RI to evaluate remedial alternatives. The remedial alternatives are examined for compliance with the requirements of CERCLA/SARA, which include protection of human health and the environment; permanency of the cleanup; reduction of volume, toxicity or mobility of hazardous substances; short- and long-term effectiveness; compliance with environmental regulations; and cost-effectiveness.

Local officials and citizens are given an opportunity to comment on the FS prior to the selection of a site remedy. A public hearing is held to solicit comments on the study and the remedial alternative chosen for implementation at a Superfund site. After reviewing public comments, the EPA prepares a Record of Decision (ROD), which is the document used to obtain EPA approval for a remedial action. The ROD will recommend either a remedial alternative or the "no action" alternative for the site.

After conducting additional studies such as the RI/FS, the EPA may conclude that no action is needed at a site because it does not present a significant threat to public health or the environment. The EPA may also conclude that conducting a response action at some sites on the NPL is not desirable because of more pressing needs at other locations.

After the ROD has been approved, the cooperative agreement between the state and the EPA must be amended to include the remedial design and implementation phase of the selected response. Remedial design involves the definition of a selected remedy with engineering criteria in a bid package. Remedial action is the actual implementation of those measures.

As of November 1, 2002, Missouri had 23 sites on the NPL. A brief description of each site follows the list. For updated information on NPL sites in Missouri, please refer to the EPA's Internet address: www.epa.gov/superfund/sites/npl/mo.htm.

NATIONAL PRIORITIES LIST SITES IN MISSOURI (Alphabetical)

1. Armour Road
2251 Armour Road
North Kansas City, Missouri
2. Bee Cee Manufacturing
Malden Industrial Park
Malden, Missouri
3. Big River Mine Tailings/
St. Joe Minerals Corp.
Sec. 25, 26, 35 & 46, T. 37N, R. 4E
Desloge, Missouri
4. Conservation Chemical
8900 Front Street
Kansas City, Missouri
5. Ellisville Site
149 Strecker Road
Ellisville, Missouri
6. Fulbright Landfill
Bolivar Road
Springfield, Missouri
7. Jasper County Site
Various Locations
Oronogo-Duenweg, Missouri
8. Lake City Army Ammunition Plant*
Junction Hwy. 7 and Hwy. 78
Independence, Missouri
9. Lee Chemical
Hwy. 210 East of Hwy. 291
Liberty, Missouri
10. Minker/Stout/Romaine Creek
4037 W. Rock Creek Rd. and Swaller Rd.
Imperial, Missouri
11. Missouri Electric Works
S. Hwy. 61, 2 Miles South of Hwy. K
Cape Girardeau, Missouri
12. Newton County Wells
3900 Rangeline Road
Joplin, Missouri
13. Oak Grove Village Well
206 James Street
Oak Grove Village, Missouri
14. Pools Prairie
East of Hwy. 71 S., South of Alt. 71, and
West of Hwy. HH
Neosho, Missouri
15. Quality Plating
Route 2
Sikeston, Missouri
16. Riverfront Site
New Haven, Missouri
17. Solid State Circuits
Main Street
Republic, Missouri
18. St. Louis Airport/HISS/Futura Coatings*
Brown Road North of Airport
Hazelwood, Missouri
19. Syntex-Verona
1st Street
Verona, Missouri
20. Valley Park TCE
Hwy. 141 North of Meramec River
Valley Park, Missouri
21. Weldon Spring Former Army Ordnance
Works*
Hwy. 94, South of U.S. 40
Weldon Spring, Missouri
22. Weldon Spring Quarry/Plant/Pits*
Hwy. 94, 2 Miles South of U.S. 40
Weldon Spring, Missouri
23. West Lake Landfill
13570 St. Charles Rock Road
Bridgeton, Missouri

*Federal Facilities

Armour Road (Clay County)

Listed: May 10, 1999

The Armour Road Site was the location of an herbicide blending facility from 1943 until 1983, and is contaminated with arsenic, antimony, pentachlorophenol, and other contaminants resulting from herbicide blending operations.

In April 1996, the EPA implemented a time-critical removal action that included covering exposed soil with geofabric and gravel and installing a 6-foot, chain-link fence at the south and east borders of the site. Approximately 100 leaking drums were overpacked and stored in the building at the site. In December 1996, the EPA entered into an agreement with one of the Potentially Responsible Parties (PRPs) to conduct an Engineering Evaluation/Cost Analysis (EE/CA) of available soil cleanup alternatives. A "Contained Out" request for the listed waste, PCP, was approved by the Hazardous Waste Program in February 2001. Any PCP found at the site that is below 1,095 ppm will be treated as a special waste and any soil contaminated with PCP above this level will carry a waste listing and appropriate disposal requirements. The final draft of the EE/CA was submitted in March 2002, and a public availability session was held on March 14. The selected remedy was excavation, treatment and off-site disposal of contaminated soil. The EE/CA was finalized in April. The draft AOC to perform the non-time critical removal action selected in the EE/CA was sent to all known PRPs in June 2002. Once a final draft of the AOC is negotiated and signed by all parties, a work plan can be completed and the removal action initiated. K.C. 1986 Limited Partnership, one of the PRPs for the site, removed its 107 drums of investigative-derived waste located inside the building in April 2002. The site is listed on the Registry (page 51).

A local site repository containing copies of completed reports and other pertinent information has been established for public review at the North Kansas City Public Library, 715 East 23 Avenue, North Kansas City, Missouri 64116.

Bee Cee Manufacturing (Dunklin County)

Listed: June 10, 1986

From 1964 to 1983, the Bee Cee Manufacturing Company operated a metal plating facility on a 2-acre site located in the Malden Industrial Park. The facility chemically cleaned and etched aluminum storm window and door frames in preparation for painting. During its metal treating operation, untreated wastewater containing chromium and other substances was discharged periodically onto the surface behind the facility. The discharge visibly contaminated an area of soil about 50 by 100 feet. Percolation of the discharged wastewater contaminated the groundwater under the site with hexavalent and trivalent chromium. In 1983, Bee Cee declared bankruptcy and ceased operations at the site. Following site characterization and investigation, the metal treating facility was demolished and removed. Shortly thereafter, the contaminated soil was excavated and removed.

The remedial action (RA) involved the installation of five additional monitoring wells in September 1999. Annual groundwater monitoring of the ten total wells at the site will track natural attenuation. It will also ensure that hexavalent chromium at concentrations in excess of the health-based standard of 18 parts per billion (ppb) is not migrating off site, and that the chromium contamination is attenuating. The preliminary closeout report prepared by the department was signed on September 10, 1999 by the EPA, and the site has attained construction completion status. Since monitoring was initiated in 1992, hexavalent chromium has been detected in only two monitoring wells above the site-specific remediation goal of 18 ppb. Hexavalent chromium was reduced from a high of 135 ppb to 13 ppb in one well and from a high of 101 ppb to 12 ppb in the other well. Total chromium has been detected in the same two wells above the site-specific remediation goals of 100 ppb. Over time, total chromium has decreased from a high of 267 ppb to 15.7 ppb and from 486 ppb to 12.2 ppb. In the 2000 annual monitoring event, chromium was found in a third well at 127 ppb, but in the last annual monitoring event, results fell below 100 ppb in this well. Annual monitoring will continue until 2003 when the Five Year Review will be completed. If hexavalent chromium and total chromium

levels continue to stay below the site-specific remediation goals, monitoring will be discontinued, the remedial action closed out, and NPL delisting procedures initiated. The site is listed on the Registry (page 181).

A local site repository containing copies of completed reports and other pertinent information has been established for public review at the Malden Branch Dunklin County Library, 113 North Madison, Malden, Missouri 63863.

Big River Mine Tailings (St. Francois County)

Listed: October 14, 1992

The Big River Mine Tailings Site, also known as the Desloge Site, consists of about 40 million cubic yards of mine tailings remaining from the milling of lead and zinc ore. The site occupies about 600 acres in an oxbow bend of the Big River. A closed solid waste landfill is located in the tailings at the southern end of the site.

On July 7, 1994, the EPA entered into an Administrative Order on Consent (AOC) with the site's responsible parties. The AOC provides for a removal action to be conducted under the Superfund Accelerated Cleanup Model. This removal action implements engineering controls to stabilize and contain on-site contamination, thereby removing off-site exposure pathways. After approval by the EPA, Phase A of the removal action began in fall 1995 and was largely completed by fall 1996. Phase B work began in the fall of 1996. The Phase B slope stabilization work was completed in fall 2000. Efforts to cover or vegetate the tailings at the Big River Site will continue beyond the completion of the slope stabilization work.

Similar removal actions to minimize erosion of tailings are anticipated for the other large mine tailings sites in St. Francois County. The responsible party began removal action construction on the western portion of the Bonne Terre Mine Tailings Site in summer 2001 pursuant to agency-approved plans and specifications. The EPA and the responsible parties continue efforts to negotiate an AOC for the Bonne Terre Mine Tailings Site eastern portion removal action. An Engineering Evaluation/Cost Analysis (EE/CA) is being completed for the National Mine Tailings Site in Park Hills in preparation for a removal action. Work on an EE/CA and risk assessment is ongoing for the Federal Mine Tailings Site in St. Joe State Park. Removal actions for the Elvins Hillclimb and borrow pit within the park have been completed. A draft EE/CA report for the Elvins/Rivermines Mine Tailings Site in Park Hills has been prepared and submitted by the responsible party for agency review and comment. In the future, EE/CAs will be completed for the Leadwood Mine Tailings Site, and possibly other mine tailings sites in St. Francois County. Work continues on an area-wide Remedial Investigation and Feasibility Study (RI/FS), which will guide selection of necessary long-term remedial actions for the area. An interim program for child blood lead levels testing, yard soil lead levels testing, and necessary yard soil removal actions began in late 2000 and will continue until a final remedy for the site is selected and implemented.

A local site repository containing copies of completed reports and other pertinent information has been established for public review at the Desloge Public Library, 209 N. Desloge Drive, Desloge, Missouri 63601, and the Mineral Area College Library, 5270 Flat River Road, Park Hills, Missouri 63601.

Conservation Chemical Company (Jackson County)

Listed: October 4, 1989

This site operated as a chemical storage and disposal facility from 1960 to 1980. Waste disposal basins, which were either unlined or poorly lined, were used to receive and store wastes and also served as containers and drying beds for byproduct sludges. Reports indicate pesticides, herbicides, waste oils, organic solvents, arsenic, acids, cyanide compounds, and other materials were disposed at the facility. An estimated 93,000 cubic yards of material was disposed and

eventually buried at the site. The site covers about 6 acres and is situated on the flood plain of the Missouri River near the confluence of the Missouri and Blue Rivers on the river side of the levee.

A remedy for cleanup of the site was selected in 1987. The following remedial measures were implemented: (1) surface cleanup and demolition of existing buildings and installation of a protective surface cap; (2) installation of an extraction well system to achieve an inward groundwater gradient, measured by four piezometer pairs along the perimeter of the site; and (3) installation of an on-site groundwater treatment system to treat extracted groundwater. The groundwater extraction and treatment system has been in operation since April 1990, and it is expected to operate for a period of at least thirty years. The discharged treated water has met all permit requirements. The site is listed on the Registry (page 74).

A local site repository containing copies of completed reports and other pertinent information has been established for public review at the Mid-Continent Public Library, 317 West Highway 24, Independence, Missouri 64050.

Ellisville Area (St. Louis County)

Listed: September 8, 1983

The Ellisville area consists of three noncontiguous sub-sites. The three sub-sites are the Bliss with contiguous properties, the Callahan property and the Rosalie property. During the 1960s and 1970s, Russell Bliss owned and operated the Bliss Waste Oil Company, a business engaged in the transportation and disposal of waste oil products, industrial waste and chemical wastes. These wastes were disposed of in pits, drums, and on the surface of properties around the company's headquarters in Ellisville. The Bliss property and sub-sites are located in western St. Louis County and cover 28 acres of land. The Callahan property is an 8-acre tract of land located about 1 mile from Ellisville. The Rosalie property is an 85-acre tract of land in which only about 4 acres were used for disposal. Soil was contaminated with 2,3,7,8-TCDD (dioxin) and volatile organic compounds (VOCs) at the Rosalie and Bliss contiguous properties. Soil at the Callahan properties contained VOCs.

The EPA and the department completed many cleanup activities at this site. Material containing dioxin above health-based levels was excavated and transported to a temporary thermal treatment unit at the Times Beach Site for thermal destruction. Drummed wastes were excavated, categorized and disposed of at appropriate Resource Conservation and Recovery Act (RCRA) Treatment, Storage or Disposal Facilities. Groundwater monitoring wells have been installed and are being sampled regularly to determine if the cleanup activities have been effective. The Bliss Site remains listed on the Registry (page 119) pending completion of groundwater monitoring.

The local site repository has been removed.

Fulbright Landfill (Greene County)

Listed: September 8, 1983

The 212-acre Fulbright Landfill Site consists of the Fulbright and Sac River Landfills. The city of Springfield used these landfills, both of which are now closed, for the disposal of municipal and industrial wastes. The Fulbright Landfill, consisting of 98 acres, accepted waste from 1962 through 1968. The Sac River Landfill, which consists of 114 acres, operated from 1968 until 1974. Industrial wastes disposed in these landfills include cyanides, acids, plating wastes, paint sludges, pesticide residues, waste oil and solvents. The groundwater at these sites contains low levels of a wide variety of VOCs and other organic chemicals, as well as heavy metals.

In 1988, under monitoring by the EPA and the department, the parties responsible for the contamination completed an extensive study of the site. The following actions have been completed

or are continuing: (1) drum removal and disposal from a sinkhole associated with the Fulbright Landfill; (2) performing groundwater and surface water monitoring for a 30-year maintenance period; (3) imposing deed restrictions to prevent future development on the site and groundwater use prohibitions; and (4) monitoring of leachate that seeps occasionally from the landfill to determine if future action is warranted to curtail it. In 1996, the city voluntarily completed a bank stabilization and leachate control project and installed an additional monitoring well. The city has been conducting pump tests to determine whether the shallow contaminated aquifer and the deep aquifer are connected. Both the Fulbright and Sac River Landfills are listed on the Registry (Pages 83 and 220, respectively).

A local site repository containing copies of completed reports and other pertinent information has been established for public review at the Springfield Greene County Library, 397 East Central, Springfield, Missouri 65801.

Jasper County (Oronogo-Duenweg Mining Belt)

Listed: August 30, 1990

The Oronogo-Duenweg Mining Belt Site, which covers 50 square miles, is considered part of the Tri-State Mining District of Missouri, Kansas and Oklahoma. Lead and zinc ores, as well as some cadmium ores, were mined from 1848 to the late 1960s, with the greatest activity occurring in an area between Oronogo and Duenweg northeast of Joplin. The site is honeycombed with underground workings, pits, and shafts (open, closed and collapsed), as well as mine tailings, waste piles, and ponds holding tailings water. An estimated 10 million tons of waste tailings are on site.

A remedial investigation of the site found residential soils, groundwater and surface water to be contaminated with heavy metals including lead, zinc and cadmium from the mining operations at 11 designated areas. A consent order was signed with the PRPs in August 1991 to conduct a Remedial Investigation/Feasibility Study on seven of 11 designated mining areas in the county. The EPA has completed removal and remedial actions on 2,600 residential yards contaminated by historic smelter emissions and mill waste. The department is funding 10 percent of this project. Approximately 200 residences contaminated with mine waste will also be included in this action.

Records of Decision to address more than 10,000 acres of mine waste and surface water contamination should be completed by mid-2003. About 75 residences have received bottled water from the EPA or former mining companies. A Record of Decision (ROD) for providing a permanent drinking water supply was issued in 1998. A remedial action connecting 225 residential properties to a permanent water supply will be completed in 2002.

Three local site repositories containing copies of completed reports and other pertinent information have been established for public review at the following locations: (1) Webb City Public Library, 101 South Liberty, Webb City, Missouri 64870; (2) Joplin Public Library, 300 Main Street, Joplin, Missouri 64801; and (3) Carl Junction City Hall, 105 North Main Street, Carl Junction, Missouri 64834.

Lake City Army Ammunition Plant (Jackson County)

Listed: July 22, 1987

The Lake City Army Ammunition Plant (LCAAP) extends more than 7 square miles. Except for a five-year period following World War II, the plant has operated since 1941. LCAAP relied heavily on lagoons, landfills and burn pits for waste disposal. These disposal areas are present at various locations within the plant facility. Industrial operations generated large quantities of potentially hazardous waste including oils, greases, solvents, explosives and metals. Groundwater beneath the site, soil, and surface water are contaminated with VOCs and heavy metals. Air strippers and groundwater extraction wells were installed to remove contaminants from extracted groundwater and to contain contaminated groundwater plumes. Further investigations leading to final cleanup activities are taking place. Recent investigations indicate contaminants have migrated off site.

The Department of Defense investigated the extent and type of on-site and off-site contamination and identified several alternative technologies for cleanup. These include pumping and treating the contaminated groundwater. The site is listed on the Registry (page 57).

Two local site repositories containing copies of completed reports and other pertinent information have been established for public review at following locations: (1) Mid-Continent Public Library-South, Blue Springs, Missouri 64015; and (2) Lake City Army Ammunition Plant, Independence, Missouri 64050.

Lee Chemical (Clay County)

Listed: June 10, 1986

The 2.5-acre Lee Chemical Site was used for packaging a variety of chemicals from 1966 to 1974, when Lee Chemical abandoned the facility. City of Liberty officials found several hundred drums of chemicals on site in 1976, most of which were removed by the city in 1977. Although the city, which owns the property, has removed visible contamination, analyses indicate trichloroethylene (TCE) and volatile organic compounds are still present in groundwater and soil. In 1980, a drinking water study detected TCE in the city's drinking water wells. Studies revealed Lee Chemical as the source of the TCE in the city's well, located 0.25 miles east of the site.

The city conducted extensive investigations and removed several hundred barrels of chemicals. The city also has monitored the well water and drinking water and managed the use of supply wells to reduce TCE in drinking water below a health standard. The city also has installed new drinking water wells. Groundwater is being extracted and released under a National Pollution Discharge Elimination System permit from an on-site extraction well and from one water supply well. An in situ soil washing system is also operating on site. The department completed a five-year review of the remedial action, which concluded that the remedial action remains protective of human health and the environment. The site is listed on the Registry (page 201).

A local site repository containing copies of completed reports and other pertinent information has been established for public review at the Liberty Public Library, 1000 South Kent, Liberty, Missouri 64048.

Minker/Stout/Romaine Creek (Jefferson County)

Listed: September 8, 1983

The Minker/Stout/Romaine Creek Site covers about 10 acres of noncontiguous properties near Imperial. One of the properties, the Bubbling Springs Ranch Horse Arena, was sprayed with dioxin-contaminated oil for dust control. The horse arena was excavated in 1972, and the dioxin-tainted soil was used as fill material in residential areas, including the Minker, Stout and Cashel residences, which eroded into Romaine Creek over time. Contaminated soils were excavated and stored in temporary buildings by the EPA in the mid- to late 1980s. In 1996, the stored soils were transported to a temporary thermal treatment unit constructed on the Times Beach Site. One state-owned property, the former Minker Property, remains listed on the Registry (page 205), due to dioxin contamination remaining at depth. The other portions of the site have been removed from the Registry. The EPA plans to remove this site from the NPL.

A local site repository containing copies of completed reports and other pertinent information has been established for public review at the EPA Information Center, I-44, Lewis Exit, Times Beach, Missouri 63025.

Missouri Electric Works (Cape Girardeau County)

Listed: February 21, 1990

The 6.5-acre Missouri Electric Works Site operated from 1953 to 1992. While in operation, the company sold, serviced and reconditioned electric motors, transformers and transformer controls. PCB-tainted waste oil, drained from the transformers, was collected for recycling. Apparently, contaminated waste oil spilled and leaked onto the ground around the facility. PCBs and VOCs have been documented in the groundwater. PCBs have also been detected in soil and sediment.

The EPA signed the Record of Decision (ROD) in 1990. The selected remedy included on-site incineration of contaminated soil and air stripping with carbon absorption of contaminated groundwater. The EPA signed an Explanation of Significant Difference (ESD) in February 1995. The ESD modified the ROD language to identify on-site thermal treatment as the selected remedy.

Remediation of all soil contamination is complete. Groundwater evaluation is ongoing. The department is awaiting the results to determine if treatment will be required.

A local site repository containing copies of completed reports and other pertinent information has been established for public review at the Cape Girardeau Public Library, 711 North Clark Street, Cape Girardeau, Missouri 63701.

Newton County Wells (Newton County)

Listed: July 27, 2000

The Newton County Wells Site is located to the southeast of the intersection of I-44 and Rangeline Road in Joplin, Missouri. The site includes the FAG Bearings (FAG) property and the villages of Silver Creek and Saginaw, located to the south.

From 1972 to 1982, FAG manufactured ball bearings and used TCE as a degreasing agent in the manufacturing process. TCE was circulated to the manufacturing area via a closed loop, supply and return, piping system. Spent TCE was distilled and the recycled TCE returned to the degreasing system.

The site was identified in 1991 when TCE contamination was discovered in residential wells in the village of Silver Creek. Subsequent investigation revealed the contamination extended throughout the village and the village of Saginaw to the south. The FAG Bearings property was the suspected source.

In 1992 and 1993, the Joplin public water system was extended into the two villages, which removed the exposure potential to local groundwater contaminated with TCE.

In 1998, FAG and the department negotiated an Abatement Order on Consent (AOC) that required FAG to investigate its property to determine source areas of TCE contamination. The AOC was expanded in 2000 to include the completion of a Remedial Investigation/Feasibility Study (RI/FS). As a result of the investigations under the 1998 AOC, source areas of TCE were discovered. Work continues on the RI/FS and the removal action. The RI is extending into the residential area.

A local site repository containing copies of completed reports and other pertinent information has been established for public review at the Joplin Public Library, Joplin, Missouri.

Oak Grove Village Well (Franklin County)

Listed: September 5, 2002

The Oak Grove Village (OGV) Well Site is located in Oak Grove Village, Missouri. On June 10, 1986, the site was identified during routine sampling conducted by the department's Public Drinking

Water Program. The site consists of an undefined and unattributed groundwater plume of trichloroethylene (TCE), which in 1991 forced the closing of the OGV well. The OGV well, located in the City Hall building, is the only source of water for the public municipal system. OGV will be purchasing water from the nearby town of Sullivan until the completion of its new well on or about December 31, 2002.

Various investigations have been conducted at the site, but none have identified any possible sources of contamination, identified any potentially responsible parties, or fully characterized the site. Currently, the state is conducting a Remedial Investigation/Feasibility Study to accomplish these tasks. Fieldwork began the spring of 2001.

A local site repository, containing copies of completed reports and other pertinent information has been established for public view at the Oak Grove Village City Hall, 260 James Street, Sullivan, Missouri 63080.

Pools Prairie (Newton County)

Listed: September 17, 1999

The Pools Prairie Site is located just outside the city limits of Neosho, Missouri. Two areas of residential wells contaminated with trichloroethylene have been identified. The contamination is believed to originate from four source areas. They include the former Air Force Plant 65 main manufacturing facility, the Engine Testing Area (ETA), the Components Testing Area (CTA), and the 900 building. Air Force contractors used the manufacturing facility to manufacture rocket engines between 1957 and 1968. Since 1968, the facility has been used for manufacturing and overhauling jet engines. The ETA and CTA were used, between 1957 and 1973, to test rocket and jet engines and related components. The 900 building was used as a warehouse and later for engine overhaul and manufacturing.

Several Administrative Orders on Consent have been executed between the EPA, the department and the potentially responsible parties to address some of the source areas and residents' exposure to contaminated groundwater. Whole-house water treatment units were provided to affected residents in the spring of 1998 as an interim measure. Construction of a permanent water supply system was completed in October 2000.

Each source area is being addressed separately. Interim measures have been implemented at the CTA to reduce further contaminant migration. This included engineering controls to reduce the infiltration of stormwater into the subsurface and the installation of a groundwater containment and treatment system. At the ETA, remaining liquids in a buried hazardous waste pit have been removed. In addition, Engineering Evaluation/Cost Analysis (EE/CA) studies are being conducted, or planned, to evaluate the need for soil removal actions at the four source areas.

Future activities are expected to include removal actions at the source areas. In addition, a site-wide Remedial Investigation/Feasibility Study (RI/FI) is being planned for the groundwater contamination plumes. The RI/FS will seek to characterize the full extent of groundwater contamination and evaluate potential groundwater cleanup alternatives.

A local site repository containing copies of completed reports and other pertinent information has been established for public review at the Neosho Public Library, 403 South Jefferson, Neosho, Missouri.

Quality Plating (Scott County)

Listed: June 10, 1986

The Quality Plating Site is located on Scott County Highway 448, north of Sikeston, Missouri. From 1978 until the facility was destroyed by fire in 1983, the site was engaged in electroplating of

common and precious metals. Improper disposal practices resulted in soil and groundwater contamination. A Phase I Remedial Investigation (RI) was completed in February 1992. Based on the RI results, the EPA conducted a Removal Action in 1992 to remove contaminated soil. Following this, the department investigated the groundwater and found that hexavalent chromium was the primary contaminant of concern.

The EPA signed the Record of Decision (ROD), selecting the final remedy, in January 1995. The selected remedy was to extract contaminated groundwater through two extraction wells, treat the groundwater by reduction/precipitation, and discharge the treated groundwater to a ditch that is about 4,000 feet east of the site.

The department initiated the remedial design activities in April 1997. Remedial activities began with the installation and sampling of the extraction and monitoring wells in order to understand the current groundwater conditions and contaminant levels. Surprisingly, groundwater sampling results revealed that chromium concentrations in the highly concentrated area of the plume had decreased from about 1,000 micrograms per liter ($\mu\text{g/l}$), detected in March 1993, to about 100 $\mu\text{g/l}$ in July 1997. A second round of sampling conducted in October 1997 confirmed this reduction.

As a result, the selected remedy was reevaluated and a new plan was proposed. Following a public comment period, the ROD was amended. The new selected remedy was Monitored Natural Attenuation. This remedy relies on natural attenuation processes, with groundwater monitoring and institutional controls, to achieve the site remediation objective. In the event that monitoring reveals no significant decrease in contaminant concentration after five years of monitoring, and the plume appears to be expanding and threatening downgradient receptors, the contingency remedy would be implemented. The original remedy selected in the 1995 ROD is the contingency remedy for the site.

A local site repository containing copies of completed reports and other pertinent information has been established for public review at the Sikeston Public Library, 221 North Kings Highway, Sikeston, Missouri 63801.

Riverfront Site (Franklin County)

Listed: December 1, 2000

The Riverfront Site, formerly known as the New Haven Public Water Supply Site, is located in New Haven, Missouri. The site was identified during routine sampling conducted by the department's Public Drinking Water Program in June 1986. The site consists of an undefined tetrachloroethylene (PCE) groundwater plume that contaminated both of New Haven's public municipal supply wells (Wells Nos. 1 and 2) located near the Missouri River. Both wells have been removed from service and two new wells (Wells Nos. 3 and 4) have been drilled. To date, PCE has not been detected in Wells Nos. 3 and 4, and both are currently supplying drinking water for New Haven.

Previous investigations have not determined the horizontal and vertical extent of the PCE contaminant plume or the potentially responsible parties (PRPs). Currently, the U.S. Environmental Protection Agency is conducting a Remedial Investigation/Feasibility Study (RI/FS) to accomplish this. Field work began in the spring of 2000.

A local site repository containing copies of completed reports and other pertinent information have been established for public view at the New Haven Scenic Regional Library, 109 Maupin, New Haven, Missouri. 63068.

Solid State Circuits (Republic, Greene County)

Listed: June 10, 1986

The Solid State Circuits Site covers 0.5 acre in downtown Republic. During a 1980 drinking water study, trichloroethylene (TCE) was detected in one of Republic's municipal water supply wells.

Further state investigations determined: (1) Solid State Circuits, a former printed circuit board manufacturer, was the source of the contamination; (2) on-site and off-site groundwater was contaminated with TCE and other volatile organic compounds; and (3) on-site soil and the building's basement were contaminated with TCE.

Site removal actions were completed between April 1983 and October 1985. They consisted of: (1) excavation and removal of over 2,000 cubic yards of contaminated material; (2) plugging and sealing the basement's well; (3) removing Republic's Municipal Well No. 1 from service; (4) installation of monitoring wells and two recovery and monitoring wells; (5) filling in the excavated basement to grade; and (6) securing the site.

Site remedial actions were completed between December 1989 and September 1994. They consisted of: (1) installation of Municipal Wells Nos. 4 and 5; (2) installation of on-site and off-site monitoring wells to monitor the cleanup of the contaminated groundwater from all three hydrologic zones; (3) installation of extraction wells to extract contaminated groundwater from all three hydrologic zones; and (4) creation of an on-site treatment facility to treat the extracted contaminated groundwater. The on-site treatment of the groundwater will continue for a period of at least thirty years or until cleanup goals are achieved. The discharged treated water has met all permit requirements. The site is listed on the Registry (page 222).

A local site repository containing copies of completed reports and other pertinent information has been established for public review at the Springfield and Greene County Library, Republic Branch, 221 W. Highway 60, Republic, Missouri 65738.

St. Louis Airport/HISS/Futura Coating (St. Louis County)

Listed: October 4, 1989

The St. Louis Airport Site (SLAPS)/Hazelwood Interim Storage Site (HISS)/Futura Coating Company Site consists of three areas covering about 32 acres. These areas were used for storing radioactive and other wastes resulting from uranium processing operations conducted in St. Louis, associated initially with the Manhattan Project of World War II. Radioactive scrap, drums of waste, and bulk waste were stored at the SLAPS in uncovered and unstabilized piles from 1947 to the mid-1960s, when they were transferred to the 9200 Latty Avenue area, later known as the HISS. In 1973, the land at the SLAPS was conveyed to the St. Louis Lambert Airport Authority.

The HISS and the Futura Coatings Company plant cover 11 acres next to Coldwater Creek. In 1966, Continental Mining and Milling Company acquired the property and recovered uranium from wastes purchased from the Atomic Energy Commission's St. Louis operations. In 1967, the company sold the property. By 1973 most processing residues had been removed. The present owner excavated contaminated soil and stored it in two large piles in the eastern portion of the 11 acres. High levels of uranium, thorium and radium are present in groundwater near the airport area and in surface and subsurface soils.

The U.S. Department of Energy (DOE) investigated the site as part of its Formerly Utilized Sites Remedial Action Program (FUSRAP). The DOE's investigation, including the St. Louis Downtown Site (SLDS), estimated as much as 1,000,000 cubic yards of contaminated material may be present. The DOE prepared a feasibility study to determine the best options for cleaning up the site.

The original feasibility study included an option for a disposal cell at SLAPS. In a general election referendum, both St. Louis City and County rejected the option of the construction of a disposal cell. A Task Force, comprised of citizens and local, state and federal agencies, was established to review and recommend remedial actions. The St. Louis Remediation Task Force, established in 1995, gave its final report recommendations on cleanup levels and land use for the FUSRAP sites in the St. Louis area. The DOE agreed to the recommendations made by the Task Force for a majority of the sites in St. Louis, with the exception of the St. Louis Airport Site.

In mid-October 1997, Congress shifted management responsibility of the FUSRAP project from the DOE to the U.S. Army Corps of Engineers (COE). The COE is working with the department, the EPA, and other stakeholders to develop cleanup levels for the North County sites (SLAPS, HISS and vicinity properties). A Record of Decision (ROD) for the FUSRAP St. Louis Downtown Site was signed by the EPA on August 27, 1998, and the COE on August 3, 1998. The COE is working on interim actions under an Engineering Evaluation/Cost Analysis (EE/CA) for the SLAPS and the HISS until the final ROD is issued for the FUSRAP sites in St. Louis County. The COE projected a completion date of late 2002 for the North County sites ROD.

As of July 2001, the DOE and the COE have performed removal actions at a total of 37 vicinity properties in North County. The COE is continuing investigations at the North County and SLDS vicinity properties. The radium pits at the SLAPS, which at one time contained high concentrations of radium and thorium, have been remediated to cleanup levels agreed to by COE and the department. Excavations at the east end of SLAPS are continuing. To date, 112,704 cubic yards of contaminated soil have been removed at SLAPS. Current estimates show that about 238,285 cubic yards of radioactively contaminated material has been shipped by the COE to licensed, out-of-state disposal facilities from both SLDS and the North County sites.

A local site repository containing copies of completed reports and other pertinent information has been established for public review at the U.S. Army Corps of Engineers, St. Louis District, FUSRAP Project Office, 8945 Latty Avenue, Berkeley, Missouri 63144 and at the St. Louis Public Library, 1301 Olive Street, St. Louis, Missouri 63102. Additional information on the FUSRAP cleanups is available at the U.S. Army Corps of Engineers Internet address: <http://www.mvs.usace.army.mil/engr/fusrap/home2.htm>.

Syntex Facility - Verona (Lawrence County)

Listed: September 8, 1983

Syntex Agribusiness, Inc., is a 180-acre site located in a rural area near Verona. Syntex acquired the plant in 1969 from the Northeastern Pharmaceutical Chemical Company (NEPACCO). Starting in 1971, the company produced vitamins and prepared animal feed and feed ingredients. From 1969 to 1971, NEPACCO leased part of the facility from Syntex. The plant manufactured hexachlorophene, which generated dioxin as a byproduct. Dioxin residues were disposed in several areas at the Verona facility, contaminating the soil and groundwater. In 1996, Syntex sold the facility portion of the site to Ducoa. In 2000, Ducoa sold the facility to BCP, Inc.

Remedial actions were split into two operable units. Operable Unit 1's (OU1) remedial activities, completed on July 31, 1988, involved disposal of dioxin-contaminated soil and sludge and demolition or decontamination of buildings and equipment. A construction completion of OU1's remedial action was issued in September 1998. Operable Unit 2's (OU2) remedial action monitored shallow groundwater at 13 wells and one river surface water sample for six quarterly monitoring reports, from June 1988 to September 1999. The quarterly groundwater monitoring was completed. The EPA is reviewing the risk assessment completed by Syntex's consultant. Additional groundwater monitoring may be needed since dioxin was detected in two samples out of a total of 112. The EPA has initiated the Five-Year Review for the site. This site is listed on the Registry as two sites, the Syntex-Verona (East) and Syntex-Verona (West) sites (page 152 and 156 respectively).

A local site repository containing copies of completed reports and other pertinent information has been established for public review at Verona Elementary School, 1011 Ella, Verona, Missouri 65769.

Valley Park TCE (St. Louis County)

Listed: June 10, 1986

The Valley Park TCE Site is located in an urban area intermingled with industrial and residential properties. The site consists of a plume of contaminated groundwater in the Meramec River alluvial

aquifer. In 1982, the department detected a number of volatile organic compounds (VOCs), including TCE, in all three municipal water supply wells serving the community. The city of Valley Park began treating the well water at the time to reduce contamination to within acceptable levels. Private wells east of the site have minor VOC contamination. Sources of contamination have been narrowed down to two or three industries in Valley Park. In 1989, Valley Park was connected to the St. Louis County public water system.

In 1990, the PRP for one identified source removed 331 cubic yards of contaminated soil and backfilled the area. In 1996, the PRPs signed a Consent Decree with the department to remediate contaminated soils and groundwater in the vicinity of their facility as a separate operable unit. The Remedial Design for cleanup was approved by the department in September 1998, and the Remedial Action began in April 1999. Another 650 cubic yards of soil was excavated and treated on site. Groundwater pump and treat has been postponed due to the discovery of MTBE contamination not associated with the responsible parties.

On August 6, 2001, the department issued a Proposed Plan for Remedial Action for the remainder of the site. The proposed plan calls for additional groundwater treatment and soil remediation similar to early actions. A Record of Decision was published in September 2001.

A local site repository containing copies of completed reports and other pertinent information has been established for public review at the Valley Park City Library, 320 Benton Street, Valley Park, Missouri 63088.

Weldon Spring Ordnance Works (St. Charles County)

Listed: February 21, 1990

The Weldon Spring Ordnance Works Site occupied more than 17,000 acres and operated from 1941 to 1945. During its operation, the site produced trinitrotoluene (TNT) and dinitrotoluene (DNT) for the U.S. Armed Services. A series of land transfers left the Army with 1,655 acres, which it has operated since 1959 for the Army Reserve as the Weldon Spring Training Area. Contaminants were spread throughout the 17,000 acres of the Weldon Springs Ordnance Works Site. Some of the transferred land, which covered two small areas of the original Ordnance Works area, is now owned by the DOE and listed on the NPL as the Weldon Spring Quarry/Plants/Pits Site. Investigations identified more than 100 contaminated areas, including unlined lagoons where TNT wastewater was stored, TNT production lines, a DNT production line, ditches below a TNT production line, and nine areas where explosive wastes were buried.

In 1989, the Department of Defense (DOD) began investigations into the extent and type of contamination. More than 90 percent of the contamination was removed or destroyed by incineration in 1998-1999. Removal of soil contamination appears to be complete as of May 2001. Quarterly monitoring of the groundwater was initiated in fall 1999. This monitoring will continue for a period of three years or until a trend of contaminant concentration can be determined. The DOD will then provide a proposed plan for the groundwater remedial action.

A local repository containing copies of completed reports and other pertinent information has been established for public review at the Kisker Road Branch of the St. Charles County Library, 1000 Kisker Road, St. Charles, Missouri 62304. Additional information can be found at the U.S. Army Corps of Engineers Internet address: <http://www.nwk.usace.army.mil/weldon/weldon.html>.

Weldon Spring Quarry/Plant/Pits (St. Charles County)

Listed: July 22, 1987

This site was once part of the Army's 17,000 acre TNT/DNT plant (the Weldon Spring Ordnance Works). In 1955, 220 acres were taken over by the Atomic Energy Commission (now DOE) for uranium processing facilities. The DOE later acquired the 9-acre quarry. The quarry is next to the

St. Charles County Drinking Water Well Field. In 1967, the Chemical Plant was transferred back to the Army and was prepared for Agent Orange herbicide production. However, the herbicide project was canceled in 1969 before production began. By 1985, the Chemical Plant was transferred back to the DOE and became a major DOE remedial project.

The DOE has characterized the site and performed numerous interim actions, which include removal of PCBs and asbestos, containerization of certain wastes, and construction and operation of two water treatment plants to treat water in the quarry and raffinate pits. Contaminants are present in the groundwater outside the quarry. Contaminants are also present in the shallow groundwater at and around the chemical plant and raffinate pits, in three lakes, and numerous springs in the adjacent state wildlife areas. DOE and department water monitoring has shown that the contaminants have not moved into the nearby water supply.

Three Record of Decision documents have been signed: one in 1990 for the quarry bulk waste removal; one in 1993 for the chemical plant; and one in September 1998, for the Quarry Residuals Operable Unit. Also, an interim Record of Decision was signed in September 2000 to address TCE contamination in groundwater associated with the Chemical Plant Site. Further pilot studies are being conducted on the groundwater. Results of those tests will be used to develop the final groundwater Record of Decision targeted to be released in 2002 or 2003.

Major actions completed include removal and placement of the Chemical Stabilization and Solidification Plant in the on-site disposal cell, demolition and placement of the on-site water treatment plant in the cell, placement of 100 percent of all scheduled contaminated soil and debris volumes in the cell, and closure of the cell which occurred in fall 2001. All site remedial actions are targeted for completion by October 2002. At that time, the long-term maintenance and monitoring will be the responsibility of the DOE's Grand Junction - Colorado office.

Construction of the Interceptor Trench System to remediate and collect information on contaminated groundwater south of the quarry area has been completed and is operational. Other work at the quarry includes characterization of two areas suspected of containing contamination, sealing of the fractures found in the floors and highwalls of the quarry, and backfilling and final capping of the quarry proper area. The Quarry Water Treatment Plant was demolished and removed as part of the quarry restoration project. An acceptable contingency plan for the St. Charles well field, institutional controls and long-term monitoring commitments remain to be completed.

Regarding long-term maintenance and monitoring, the DOE is expected to have a document in place, often referred to as a Stewardship Plan, to identify the who, what, when and how much aspects of long-term care. Efforts in the past have not addressed enforceability, clear definition of roles and responsibility, consistent funding, and commitment to science and technology development into the future. Development of an acceptable stewardship plan is anticipated this coming year.

A local site repository containing copies of completed reports and other pertinent information has been established for public review at the Spencer Creek Branch, St. Charles City-County Library, 425 Spencer Road, St. Peters, Missouri 63376.

West Lake Landfill (St. Louis County)

Listed: August 30, 1990

The 200-acre West Lake Landfill Site is in the flood plain of the Missouri River, next to prime agricultural land. From 1939 to 1987, limestone was quarried on the site. Beginning in 1962, portions of the property were used for landfilling of solid and industrial wastes. In 1973, Cotter Corporation disposed of more than 43,000 tons of uranium ore processing residues and soil in two areas, covering a total of 16 acres of the site. Sampling has indicated on-site soil and groundwater contain uranium.

The EPA and the Potentially Responsible Parties (PRPs) signed an Administrative Order on Consent (AOC) in March 1993 to conduct a Remedial Investigation/Feasibility Study (RI/FS) of the radiological contaminated portions of the landfill (Operable Unit 1). A second AOC to perform an RI/FS for the non-radiological hazardous waste portions of the landfill (Operable Unit 2) was negotiated by Laidlaw Waste Systems and the EPA and executed in December 1994.

A draft RI report and risk assessment has been completed for Operable Unit 1. The RI report revealed that radionuclides are present in a dispersed manner throughout the upper part of the landfill deposits. Erosion of surface soil and subsequent sediment transport has resulted in off-site migration. Radionuclides detected in groundwater beneath and adjacent to Areas 1 and 2 generally were below the background levels.

A draft Feasibility Study (FS) evaluating potential remedial alternatives has been prepared and presented to the public for comment. Following approval of the FS, a remedy will be selected and documented in a Record of Decision.

A draft RI report for Operable Unit 2 has been completed. Following approval of the RI report, an FS will evaluate remedial alternatives for the non-radiological portions of the site. The site is listed on the Registry (page 166).

A local site repository containing copies of completed reports and other pertinent information has been established for public review at the U.S. Environmental Protection Agency, Region VII, Community Relations Office, 726 Minnesota Avenue, Kansas City, Kansas 66101.

SITE EVALUATION INVENTORIES

The department's Hazardous Waste Program (HWP) is committed to identifying and evaluating potential hazardous waste sites in Missouri. The HWP is currently involved in a comprehensive, statewide effort to locate and evaluate the potential hazards posed by past practices at abandoned or unregulated facilities. As part of this effort, the HWP's Superfund Section maintains inventories of known and suspected former manufactured gas plants (FMGPs), former U.S. Department of Agriculture grain bins, lead and zinc smelters, and wood treaters. Those sites listed on the Registry of Confirmed Abandoned or Uncontrolled Hazardous Waste Disposal Sites in Missouri (Registry) are indicated in the "Status" column of the inventories below. Every effort has been made to make these inventories as accurate and current as possible; however, many other sites have been identified using historical information and have not yet been confirmed or assessed. The verification and investigation of these sites is an ongoing effort. As further information is discovered, suspected sites may be added or removed from the inventories.

FORMER MANUFACTURED GAS PLANTS INVENTORY

Before natural gas was readily available, many municipal and industrial gas plants manufactured gas from coal. Today these sites are known as former manufactured gas plants or FMGPs. The coal gas production process generated many wastes, including coal tar, which were often spilled or buried on site. Coal tar is composed of thousands of different chemicals. The primary chemical contaminants of concern found in coal tar are potentially carcinogenic polycyclic aromatic hydrocarbons and volatile organic compounds. Other contaminants that may present a risk at FMGP sites include cyanide and several metals.

As of June 30, 2002, 87 sites are listed on the FMGP Inventory. Of these 87 sites, 10 are actively being investigated by the Superfund Section's Site Evaluation Unit (SEU), 22 are undergoing some form of remediation, monitoring or removal activities, 33 have completed investigations, and the remaining 22 are pending investigation by the SEU. For any questions regarding these sites, or FMGPs in general, please contact the HWP's Superfund Section at (573) 751-8629.

The following list only includes sites where an FMGP has been confirmed at that location; suspected sites that have not been confirmed or assessed are not listed in this document.

Former Manufactured Gas Plants			
Site (Alias)	Address	County	Status
Atlanta FMGP (FE Atteberry MGP)	2 blocks W of old depot	Macon	SEU NFAP
Aurora FMGP	Crescent Street and Adams Avenue	Lawrence	SEU NFAP
Bonne Terre FMGP (St. Joseph Lead)	Benham Street and railroad tracks	St. Francois	SEU NFAP
Boonville FMGP (Sumbart FMGP/Union Electric Service Building - Boonville)	301 2 nd Street	Cooper	Voluntary Cleanup Program cleanup ongoing
Brookfield FMGP	N. Monroe & Boston St.	Linn	Negotiations for cleanup ongoing
Cape Girardeau FMGP (MO Utilities FMGP)	500 North Main	Cape Girardeau	Voluntary Deed Notice filed – SEU NFAP
Carondelet Coke Corporation (St. Louis FMGP#1 and #7, Carondelet FMGP)	526 East Catalan / 7200 South Broadway	St. Louis City	Voluntary Cleanup Program cleanup ongoing
Carthage FMGP #1 (Carthage Gas & Light)	SE Corner of Main (411) and Limestone	Jasper	SEU NFAP
Carthage FMGP #2 (Acme, Quapaw Gas)	SW Corner of Claxton and North Main	Jasper	Requested Voluntary Deed Restriction
Chillicothe FMGP	Bridge & Calhoun St.	Livingston	Listed on Registry

Site (Alias)	Address	County	Status
Clinton FMGP	6 th Street and Elm	Henry	EPA Removal Completed
Columbia Coal Gas	Orr and Ash Street	Boone	Annual Monitoring by EPA
Crystal City Dump (Old City Dump)	County Road, South of Crystal Avenue	Jefferson	Voluntary Cleanup Program cleanup ongoing
Excelsior Springs FMGP (Excelsior Springs Light & Power)	400 West Excelsior	Clay	Negotiations for cleanup ongoing
Fulton FMGP (MO School for the Deaf)	505 East 5 th Street	Callaway	SEU NFAP
Hannibal FMGP #1 (Hannibal Gas Co.)	US Hwy 63 and 3 rd St.	Marion	Requested Voluntary Deed Restriction
Hannibal FMGP #2 (United Cities Gas Co.)	Corner of South 11 th and Collier	Macon	Cooperative Program cleanup ongoing
Huntsville FMGP (Huntsville Gas Works)	South Depot Street	Randolph	Voluntary Cleanup Program cleanup ongoing
Independence FMGP #1	Pacific and Grand Ave.	Jackson	Listed on Registry
Independence FMGP #2 (Missouri Gas Energy)	23 rd Street and Pleasant Avenue	Jackson	SEU investigation planned
Jefferson City FMGP (Jefferson City Light, Heat & Power Company)	400 West Main Street	Cole	Voluntary Cleanup Program cleanup ongoing
Joplin FMGP #1	516 East 5 th Street	Jasper	EPA NFAP
Joplin FMGP #2	2 nd St. & Kentucky Ave.	Jasper	EPA NFAP
Kansas City FMGP #1 (Kansas City Coal Gas, Station A)	East 1 st Street and Campbell	Jackson	Voluntary Cleanup Program cleanup ongoing
Kansas City FMGP #2 (Kansas City Coal Gas, Station B)	Campbell and East 3 rd Street	Jackson	Voluntary Cleanup Program cleanup ongoing
Kansas City FMGP #3 (MGE Natural Gas Storage/Kansas City Gas Light)	20 th and Indiana Ave.	Jackson	Voluntary Cleanup Program – Clean Letter
Kansas City FMGP #4 (Pintsch Gas Compressing)	12 Union Station	Jackson	SEU investigation ongoing
Kansas City FMGP #5 (Missouri Gas Co.)	Southwest Station (South of 25 th Street)	Jackson	Requested Voluntary Deed Restriction
Keytesville FMGP	Northwest of Beech and Ash Streets	Chariton	SEU NFAP
Kirksville FMGP (Heetco Inc. / Kirksville Light, Heat)	118 South Wabash	Adair	Voluntary Cleanup Program cleanup ongoing
Lexington FMGP #1 (Missouri Gas & Electric Service)	Farrar and Southwest	Lafayette	SEU investigation planned
Lexington FMGP #2 (Missouri Gas & Electric Service)	10 th and Highland	Lafayette	EPA Removal ongoing
Louisiana FMGP #1 (Carbon Light Co.)	5 th and Delaware	Pike	Voluntary Deed Notice Filed – SEU NFAP
Louisiana FMGP #2 (US Bureau of Mines)	Hwy 79 & County Rd. D	Pike	Voluntary Deed Notice Filed – SEU NFAP
Macon FMGP (Macon Gas & Electric Co.)	216 Vine Street	Macon	Voluntary Deed Notice Filed – SEU NFAP
Marshall FMGP #1 (MO Gas & Electric Co.)	401 North Lafayette	Saline	SEU investigation ongoing
Marshall FMGP #2	English and Eastwood	Saline	Voluntary Deed Restriction Filed – SEU NFAP
Mexico FMGP (Mexico Electric Light)	Southwestern Street and High Street	Audrain	Voluntary Deed Notice Filed – SEU NFAP
Moberly FMGP (Moberly Gas Light Co.)	509 Dameron	Randolph	Negotiations for cleanup ongoing
Morrison FMGP (Frenchmann Gas Co.)	Meyer Ave. & 2 nd Street	Gasconade	SEU NFAP
Mound Street FMGP (St. Louis FMGP #3, #19, Laclede Coal Gas, Station B)	Mullanphy Street/ Mound and Broadway	St. Louis City	EPA NFAP
Nevada FMGP (Nevada Gas & Electric Light)	East Walnut and East Austin Street	Vernon	Voluntary Deed Restriction filed—SEU NFAP
Park Hills FMGP (Doe Run Lead Company Shaft No. 2)	10 Church Street	St. Francois	Voluntary Deed Notice filed – SEU NFAP
Parkville FMGP (Parkville Oil Company / Hugh T. Jones)	Not Applicable	Platte	SEU NFAP
Pittsburgh Plate Glass Industries (PPG / Crystal City FMGP)	26 Mississippi Avenue	Jefferson	Voluntary Cleanup Program cleanup ongoing
Rich Hill FMGP	700 East Pine	Bates	EPA NFAP

Site (Alias)	Address	County	Status
Sedalia FMGP #1 (City Light & Traction Co.)	North Moniteau and Benton	Pettis	EPA Removal ongoing
Sedalia FMGP #2 (Sedalia Coal Gas)	Broadway Street and Moniteau	Pettis	EPA NFAP
Shrewsbury FMGP (Webster Groves FMGP / St. Louis FMGP #4)	4118 Shrewsbury Ave.	St. Louis	EPA Removal ongoing
Springfield FMGP (Springfield Gas & Electric Company)	North Main and West Phelps	Greene	EPA NFAP
St. Charles FMGP (St. Charles Lighting Co.)	Washington Street and North Riverside	St. Charles	Listed on Registry
St. Joseph FMGP #1 (St. Joseph Light & Power)	South 4 th and Cedar	Buchanan	EPA Removal ongoing
St. Joseph FMGP #2 (Citizen's Gas Light Company)	510-514 South 5 th St.	Buchanan	EPA NFAP
St. Joseph FMGP #3	South 6 th and Lafayette	Buchanan	Requested Voluntary Deed Restriction
St. Joseph FMGP #4	802 South 5 th Street	Buchanan	NFAP – duplicate of St. Joseph FMGP #3
St. Louis FMGP #2 (Laclede Gas Station A)	S. 2 nd St. & Convent St.	St. Louis City	EPA NFAP
St. Louis FMGP #6	Block of Convent, South Main, and Levy	St. Louis City	NFAP – duplicate of St. Louis FMGP #2
St. Louis FMGP #10 (St. Louis Gas, Fuel, & Power)	603 North 6 th Street	St. Louis City	EPA NFAP
St. Louis FMGP #12 (Glendale FMGP / Glendale Zinc Works)	Blow and Water Streets	St. Louis City	SEU NFAP
St. Louis FMGP #15 (St. Louis Gas Light Company)	15 th and Gratiot Street	St. Louis City	SEU investigation planned
St. Louis FMGP #17	S. 14 th St. & Singleton	St. Louis City	NFAP – duplicate of St. Louis FMGP #15
St. Louis FMGP #19	Howard Street	St. Louis City	NFAP – duplicate of St. Louis FMGP #3
St. Louis FMGP #21 (Laclede Gas Company Station H)	Piedmont and Gasconade	St. Louis City	SEU evaluation ongoing
Trenton FMGP	Northeast corner of Grant and 10 th Street	Grundy	Registry evaluation ongoing
Warrensburg FMGP	Not Applicable	Johnson	EPA NFAP
NFAP = No Further Action Planned SEU = Missouri Department of Natural Resources' Site Evaluation Unit EPA = U.S. Environmental Protection Agency			

FORMER USDA GRAIN BINS INVENTORY

In the 1940s, the Commodity Credit Corporation (CCC) was created within the U.S. Department of Agriculture (USDA) to stabilize, support and protect farm income and prices, while distributing and maintaining adequate supplies of agricultural products in the United States. As part of this objective, the CCC initiated large-scale grain bin construction projects throughout the U.S. in the late 1940s for the storage of surplus grain. During storage, the grain was fumigated to control destructive insects. The most commonly used fumigant was an 80/20 mixture of carbon tetrachloride and carbon disulfide. CCC terminated its grain storage program by the early 1970s and sold all existing grain storage bins and equipment. Groundwater contaminated with carbon tetrachloride has been discovered in the vicinity of some of these grain storage areas. The U.S. Environmental Protection Agency (EPA) has determined that carbon tetrachloride is a probable human carcinogen.

As of June 30, 2002, 69 sites are listed on the Former USDA Grain Bins Inventory. All of these sites have undergone EPA Pre-CERCLIS Site Screening evaluation. Of the 69 sites, 49 were determined to pose no significant threat to human health and the environment and therefore need no further action, one is awaiting decision by the EPA and 19 were referred to the state for additional investigation. Of these 19 sites, one is undergoing investigation by the SEU, 14 have investigations completed and need no further action, and four are in negotiations for some form of monitoring, remediation or removal activity. An additional 14 sites have not been confirmed or investigated by the EPA or the SEU. If you have any questions regarding these sites, or former USDA grain bins in general, please contact the HWP's Superfund Section at (573) 751-8629.

The following list only includes sites where a former USDA grain bin site has been confirmed at that location; suspected sites that have not been confirmed or assessed are not listed in this document.

Former USDA Grain Bins			
Site	Address	County	Status
Albany	Hwy 136 East	Gentry	Negotiations ongoing
Bethany	NE of intersection of US 69 & US 136	Harrison	SEU NFAP
Boonville	Not Available	Cooper	EPA NFAP
Bowling Green	Not Available	Pike	EPA NFAP
Burlington Junction	Hwy 136	Nodaway	SEU NFAP
Butler	Not Available	Bates	EPA NFAP
Carrollton	601 Stonewall St	Carroll	EPA NFAP
Carthage	Not Available	Jasper	EPA NFAP
Chillicothe	1368 LIV 247	Livingston	SEU evaluation ongoing
Clearmont	N of Hwy C West, within city limits	Nodaway	EPA NFAP
Columbia	Not Available	Boone	EPA NFAP
Craig	Hwy 59, 1 mile E of Craig	Holt	EPA NFAP
Edina	Not Available	Knox	EPA NFAP
Fairfax #1 - Meyer	SW corner of S 1st and Sly Streets	Atchison	SEU NFAP
Fairfax #2 - Seymour	SW of junction of Hwy J & Hwy 59	Atchison	SEU NFAP
Faucett	Not Available	Buchanan	EPA NFAP
Fayette	232 State Route W	Howard	SEU NFAP
Forest City	Hwy 111	Holt	Negotiations ongoing
Fulton	Not Available	Callaway	EPA NFAP
Gallatin	Not Available	Daviess	EPA NFAP
Grant City	Old Hwy 69, 1 mi S of SR 46	Gentry	EPA NFAP
Harrisonville	Not Available	Cass	EPA NFAP
Henriette North	Not Available	Ray	EPA NFAP
Henriette South	Not Available	Ray	EPA NFAP
Higginsville	Not Available	Lafayette	EPA NFAP
Kahoka	Not Available	Clark	EPA NFAP
Keytesville	Not Available	Chariton	EPA NFAP
Kingston	Not Available	Caldwell	EPA NFAP
Langdon	Route 111, 1 mile S of I-29	Atchison	SEU NFAP
Liberty	Not Available	Clay	EPA NFAP
Macon	1121 S. Missouri Ave	Macon	EPA NFAP
Maitland	W of Hwy 113, 1 mi S of Maitland	Holt	EPA NFAP
Malta Bend	East end of Ann St	Saline	EPA NFAP
Marshall	854 N Miami Ave	Saline	EPA NFAP

Site	Address	County	Status
Maryville-Beal Park	402 N Depot	Nodaway	SEU NFAP
Maryville-Sprint	Hwy 136, 0.5 miles E of Maryville	Nodaway	SEU NFAP
Maysville	2822 S Hwy 33	DeKalb	EPA NFAP
Memphis	Not Available	Scotland	EPA NFAP
Mendon (North)	Northeast end of Pine St	Chariton	EPA NFAP
Mendon (South)	SE Corner, Hwy 11 and CR 205	Chariton	EPA NFAP
Mexico	Not Available	Audrain	EPA NFAP
Milan	Not Available	Sullivan	EPA NFAP
Montgomery City	Intersection of Route 19 & Fairground Rd	Montgomery	Negotiations ongoing
Montgomery City #2	Not Available	Montgomery	EPA NFAP
Monticello	Not Available	Lewis	EPA NFAP
Mound City	W side of North Hwy N	Holt	EPA NFAP
New London	Not Available	Ralls	EPA NFAP
Palmyra	Not Available	Marion	EPA NFAP
Paris	Not Available	Monroe	EPA NFAP
Platte City	Not Available	Platte	EPA NFAP
Plattsburg	N of Hwy C at S edge of city	Clinton	EPA NFAP
Princeton	Intersection of Hobson and Prichard streets	Mercer	SEU NFAP
Ravenwood	Bently St.	Nodaway	SEU NFAP
Savannah	W Hwy 71	Andrew	Negotiations ongoing
Sedalia	Not Available	Pettis	EPA awaiting decision
Shelbina	Not Available	Shelby	EPA NFAP
Sheridan	Not Available	Worth	EPA NFAP
Skidmore	Between Reaksecker and Kuntzman Streets in NW Skidmore	Nodaway	EPA NFAP
Slater	Hwy 240, south of Jefferson St.	Saline	EPA NFAP
St. Charles	W of intersection of W Clay & First Capitol	St. Charles	SEU NFAP
St. Joe/Muni.	Not Available	Buchanan	EPA NFAP
St. Peters	216 2nd St	St. Charles	EPA NFAP
Tarkio	S side of Tarkio, E of Hwy 59	Atchison	SEU NFAP
Treloar	Not Available	Warren	EPA NFAP
Trenton	1712 Harris Ave	Grundy	SEU NFAP
Troy	Not Available	Lincoln	EPA NFAP
Union	Not Available	Franklin	EPA NFAP
Unionville	Not Available	Putnam	EPA NFAP
Westboro	State Route O	Atchison	SEU NFAP
NFAP = No Further Action Planned Not Available = Exact addresses have not yet been provided by the EPA SEU = Missouri Department of Natural Resources' Site Evaluation Unit EPA = U.S. Environmental Protection Agency			

LEAD AND ZINC SMELTER INVENTORY

For nearly one hundred and fifty years, the state of Missouri has been one of the world's largest producers of lead and zinc metals. Historically, lead and zinc ores were mined, crushed, and transported to smelters throughout the state to be processed into raw metals. It is common to find lead or zinc contamination in soils, groundwater and surface water surrounding smelter sites. This contamination comes from dust escaping the furnace smokestacks, the production process, and the slag piles. The most common contaminants found at smelter sites include lead, zinc, cadmium, barium, chromium and other metals.

As of June 30, 2002, a total of 141 sites are listed on the Lead and Zinc Smelter Inventory. Of these 141 smelters, only three are active facilities: the Herculaneum Lead Smelter, the Glover Smelting Facility (formerly the ASARCO, Inc.-Glover smelter), and the Buick Resource and Recycling Facility (formerly the Buick Smelter). All three smelters are now owned and operated by the Doe Run Company. Doe Run has entered into an Administrative Order on Consent (AOC) with the EPA and the department to conduct a time critical removal action at the Herculaneum Lead Smelter. The Glover Smelting Facility is being cleaned up by ASARCO under a Consent Decree with the department. The Buick Smelter was originally investigated under CERCLA by the EPA with no further action recommended. However, contamination from the historic smelting operations is being addressed under a RCRA permit with department oversight. The Buick facility is now operating as a secondary smelter, also under RCRA permit.

The remaining 138 smelters on the inventory are all historic facilities that range from a primitive furnace that smelted as little as 20 tons of ore from one small lead mine to large smelters that smelted over 11,000 tons of ore from many surrounding mines. Of these 138 historic smelters, 27 are associated with the Oronogo-Duenweg Mining Belt Site, commonly referred to as the Jasper County Mining Site, and 14 smelters are associated with the Newton County Mine Tailings Site. All the smelters associated with those two mining sites are being investigated and remediated by the EPA as part of those mining sites. The remaining sites are broken down as follows: two sites have been investigated by the SEU with no further action recommended, four sites are currently being investigated by the SEU, and the remaining 91 sites are pending investigation by the SEU. For any questions regarding these sites, or lead and zinc smelting in general, please contact the HWP's Superfund Section at (573) 751-8629.

The following list only includes sites where a smelter has been confirmed at that location through investigation or historic documentation; suspected sites that have not been confirmed or assessed are not listed in this document.

Lead and Zinc Smelters				
Name	Address	Nearby Town	County	Status
Abbyville Mining & Smelting Co.	6.5 miles southeast of Sullivan	Sullivan	Washington	SEU investigation planned
ASARCO Inc - Glover	Highway 49 S	Glover	Iron	RCRA Deferred
Avon Furnace	NE 1/4 of Section 12, T 37 N, R 7 E	Avon	Ste. Genevieve	SEU investigation planned
Bartle, J.N. Furnace	Unknown	Unknown	Franklin	SEU investigation planned
Benton	Unknown	Unknown	Benton	SEU investigation planned
Bisch's Furnace	SW 1/4 of Section 18, T 38 N, R 5 E	Bonne Terre	St. Francois	SEU investigation planned
Boase's Furnace	On Mill Creek	Unknown	Washington	SEU investigation planned
Bond's Air Furnace	SE 1/4 of NE 1/4 of Section 16, T 40 N, R 17 W	Laurie	Morgan	SEU investigation planned
Brushy Furnace	Unknown	Unknown	Morgan	SEU investigation planned

Name	Address	Nearby Town	County	Status
Buffalo Air Furnace	Section 1, T 41 N, R 19 W, near the Buffalo Diggings	Stover	Morgan	SEU investigation planned
Bugg Furnace	1.5 miles West of Potosi	Potosi	Washington	SEU investigation planned
Buick Smelter	Highway KK	Boss	Iron	EPA NFAP - RCRA Permitted Facility
Casey & Clancey's Furnace	Casey & Clancey's Diggings, located in Section 16, T 38 N, R 2 E	Potosi	Washington	SEU investigation planned
Central Lead Co.	SE 1/4 of Section 7, T 36 N, R 5 E	Rivermines	St. Francois	SEU investigation planned
Cherokee-Lanyon Zinc Smelter	Smelter & Second Streets	Nevada	Vernon	SEU NFAP
Chouteau	Unknown	Unknown	Cole	SEU investigation planned
Christian County Furnace	Unknown	Unknown	Christian	SEU investigation planned
Clark's Air Furnace	Section 21, T 42 N, R 18 W	Versailles	Morgan	SEU investigation planned
Cockerill Zinc Smelter	Alma & Douglas Streets	Nevada	Vernon	SEU NFAP
Cole Camp Furnace	Cole Camp Mines, located in NE 1/4 of NE 1/4 of Section 32, T 42 N, R 21 W	Cole Camp	Benton	SEU investigation planned
Collier White Lead and Oil Co.	Clark Ave & 9th St	St. Louis	St. Louis	SEU investigation planned
Collins Diggings Furnace	SE 1/4 of SW 1/4 of Section 19, T 49 N, R 18 W	Blackwater City	Cooper	SEU investigation planned
Creswell's Furnace	SE 1/4 of SW 1/4 of Section 5, T 38 N, R 2 E	Potosi	Washington	SEU investigation planned
Deane's Furnace	Near Potosi	Potosi	Washington	SEU investigation planned
Desloge Consolidated Co. Furnace	At Big River Tailings Pile	Desloge	St. Francois	SEU investigation planned
Desloge Lead Co. Smelter	North side of 400 Block of Benham St. in Bonne Terre	Bonne Terre	St. Francois	SEU investigation planned
Doe Run Smelter	In Doe Run	Doe Run	St. Francois	SEU investigation planned
Eanes & Berry Air Furnace	N 1/2 of Section 32, T 44 N, R 14 W	Russellville	Moniteau	SEU investigation planned
Eureka Air Furnace	SE 1/4 of NW 1/4 of Section 23, T 43 N, R 14 W	Russellville	Cole	SEU investigation planned
Flynn and Long Furnace	Unknown	Unknown	Franklin	SEU investigation planned
Flynn's Furnace	Downtown Richwoods	Richwoods	Washington	SEU investigation ongoing
Frumet Furnaces	Sections 28, 33, & 34, T 40 N, R 3 E	Fletcher	Jefferson	SEU investigation planned
Gabriel Furnace	Unknown	Unknown	Morgan	SEU investigation planned
Gallaher's Furnace	Section 19, T 41 N, R 1 W	Stanton	Franklin	SEU investigation planned
Glendale Zinc Works	E. Nagel St & Mississippi River	St. Louis	St. Louis	SEU investigation ongoing
Grassroot Air Furnace	SE 1/4 of SW 1/4 of Section 23, T 41 N, R 14 W	Eldon	Miller	SEU investigation planned
Gray's Smelter	Unknown	De Soto	Jefferson	SEU investigation planned
Gum Spring Furnace	Unknown	Unknown	Morgan	SEU investigation planned
Handlin Air Furnace	W 1/2 of Section 9, T 42 N, R 17 W, near New Granby Diggings	Versailles	Morgan	SEU investigation planned
Herculaneum Lead Smelter Site	881 Main St	Herculaneum	Jefferson	Time Critical Removal Action Ongoing
Hesselmeyer Furnace	Unknown	Potosi	Washington	SEU investigation planned
Hibler's Furnace	3 miles from Williams' Mines, located west of Mineral Hill in Section 32, T 40 N, R 2 E	Leasburg Village	Crawford	SEU investigation planned

Name	Address	Nearby Town	County	Status
Higginbotham's Furnace	Section 27, T 39 N, R 3 E (near Fertile post office)	Fertile	Washington	SEU investigation planned
Hill's Furnace	Unknown	Unknown	Washington	SEU investigation planned
Hopewell Furnace	Unknown	Hopewell	Washington	SEU investigation planned
Inge's Furnace	Unknown	Sullivan	Franklin	SEU investigation planned
Irondale Blast Furnace	At Irondale Mine, NW 1/4 of Section 15, T 36 N, R 3 E	Irondale	Washington	SEU investigation planned
J.D. Woodworth & Co.	SE 1/4 of SE 1/4 of Section 21, T 43 N, R 14 W	Enon	Cole	SEU investigation planned
Kingston	Unknown	Unknown	Washington	SEU investigation planned
Linn Creek Air Furnace	Section 25, T 39 N, 17 W (less than 1/2 mile from Linn Creek)	Linn Creek	Camden	SEU investigation planned
Long's Furnace #1	Unknown	Old Mines	Washington	SEU investigation planned
Long's Furnace #2	Unknown	Potosi	Washington	SEU investigation planned
Long's Furnace #3	Section 17, T 38 N, R 2 E (7 miles NW of Potosi)	Potosi	Washington	SEU investigation planned
Mammoth Furnace	NW 1/2 of NW 1/4, Section 12, T 39 N, R 3 E	Fletcher	Jefferson	SEU investigation planned
Manning's Furnace	Unknown	Webster (not on present day maps)	Washington	SEU investigation planned
Marmaduke Air Furnace	Section 19, T 49 N, R 19 W	Nelson	Saline	SEU investigation planned
McIlvaine's Furnace	1 mile southwest of Potosi	Potosi	Washington	SEU investigation planned
Miller County Mining & Smelting Co	7 miles north of Tuscumbia, 10 miles south of Olean	Eldon	Miller	SEU investigation planned
Mine a Burton	A Branch of Mineral Fork	Unknown	Washington	SEU investigation planned
Mine LaMotte Smelter	Copper Mines Rd & SR OO	Fredericktown	Madison	SEU investigation ongoing
Missouri Lead & Oil Co.	S. Trudeau & Kosciusko	St. Louis	St. Louis	SEU investigation planned
Moran, Charles Furnace	3 Miles East of Richwoods	Richwoods	Washington	SEU investigation planned
Moselle Furnace	Unknown	Unknown	Franklin	SEU investigation planned
Mrs. Thomas S. White	Unknown	Unknown	Washington	SEU investigation planned
Newton County Mine Tailings (14 smelters)	Various Locations	Granby, Joplin and Neosho	Newton	EPA Removal Action ongoing
Northumberland Furnace	Unknown	St. Clair	Franklin	SEU investigation planned
O'Brien's Scotch Hearth	Section 17, T 41 N, R 17 W	Gravois Mills	Morgan	SEU investigation planned
Old Scott Air Furnace	NE 1/4 of Section 26, T 49 N, R 19 W	Blackwater City	Cooper	SEU investigation planned
Oronogo-Duenweg Mining Belt (27 smelters)	Various Locations	Joplin	Jasper	NPL - Removal Action Complete
Otterville Air Furnace	Section 21, T 45 N, R 19 W	Otterville	Morgan	SEU investigation planned
Palmer Lead Company	Palmer	Palmer	Washington	SEU investigation planned
Panther Creek Smelter	Panther Creek north of Diggins	Diggins	Webster	SEU investigation planned
Peninsular Mine Furnace	Sections 15, 16, 17, T 42 N, R 1 W	St. Clair	Franklin	SEU investigation planned
Perry's Furnace	Near Perry's Mine, located at E 1/2 of NE 1/4 of Section 18, T 38 N, R 5 E	Halifax	St. Francois	SEU investigation planned
Pioneer Air Furnace	NW 1/4 of Section 25, T 41 N, R 14 W	Eldon	Miller	SEU investigation planned

Name	Address	Nearby Town	County	Status
Pratt's Mill Air Furnace	Unknown	Russellville	Cole	SEU investigation planned
Reed & Hoffman	Unknown	St. Louis	St. Louis	SEU investigation planned
Rich Hill Zinc Works	Unknown	Rich Hill	Bates	SEU investigation planned
Richwood's Furnaces	Unknown	Richwoods	Washington	SEU investigation planned
Rozier & Wilkinson's Smelter	NE 1/4 of Section 29, T 35 N, R 9 E	Clearwater	Perry	SEU investigation planned
Sandy Mines	N 1/2 of Section 18, T 41 N, R 5 E	Hillsboro	Jefferson	SEU investigation planned
Shibboleth Furnace	One mile NW of Cadet	Cadet	Washington	SEU investigation ongoing
Silver Lead Furnace	Unknown	Unknown	Franklin	SEU investigation planned
Slogdill & Wilson Furnace	Near Brookline	Brookline	Greene	SEU investigation planned
Southern White Lead & Color Company	Lombard St between 2nd & Main St	St. Louis	St. Louis	SEU investigation ongoing
Southwestern Lead and Zinc Co.	Unknown	Rich Hill	Bates	SEU investigation planned
St. Joseph Lead Co. Smelter	South side of 400 Block of Benham St. in Bonne Terre	Bonne Terre	St. Francois	SEU investigation planned
St. Louis Lead & Oil Works	Cass Ave & N. 10th St	St. Louis	St. Louis	SEU investigation planned
St. Louis Smelting & Refining Co.	SE Corner Manchester Ave & Macklind Ave	St. Louis	St. Louis	SEU investigation planned
Sugar Creek Furnace	In vicinity of Sugar Creek Diggings, located in Section 17, T 41 N, R 11 W (near Scheiler's ferry)	Meta	Osage	SEU investigation planned
T. & W. Murphrey's Furnace	1 Mile Southeast of Cruise post office	Cruise (not on present day maps)	Washington	SEU investigation planned
Taronto	Near Taronto, In southeastern corner of Camden County	Taronto (not on present day maps)	Camden	SEU investigation planned
Taylor, W.R. Furnace	In Taylor Place, in vicinity of Taylor's Shaft, located in SW 1/4 of SW 1/4 of NE 1/4 of Section 6, T 37 N, R 5 E	Bonne Terre	St. Francois	SEU investigation planned
Union Mining and Smelting Co.	NE 1/4 of SE 1/4 of Section 13, T 38 N, R 2 E	Old Mines	Washington	SEU investigation planned
Valle & Skewes' Furnace	Cove Mine at SE 1/4 of SW 1/4 of Section 20, T 41 N, R 1 W	St. Clair	Franklin	SEU investigation planned
Valles Mines Company	14116 Valles Mines School Rd	Valles Mine	Jefferson	SEU investigation ongoing
Virginia Mine's Furnace	Section 16, T 41 N, R 1 E	Lonedell	Franklin	SEU investigation planned
Walton's Furnace	Palmer Mines	Palmer	Washington	SEU investigation planned
White Diggings' Furnace	NW 1/4 of SW 1/4 of Section 28, T 39 N, R 21 W	Fristoe	Benton	SEU investigation planned
White, Mrs. L.J.	Unknown	Old Mines	Washington	SEU investigation planned
White's Furnace	In vicinity of Old Mines	Old Mines	Washington	SEU investigation planned
Wyant Spring Air Furnace	SE 1/4 of NW 1/4 of Section 32, T 42 N, R 17 W	Gravois Mills	Morgan	SEU investigation planned

NFAP = No Further Action Planned
Unknown = Historical information obtained by the EPA documented that a smelter operated in the county indicated; however, an exact location has not been determined.
SEU = Missouri Department of Natural Resources' Site Evaluation Unit
EPA = U.S. Environmental Protection Agency

WOOD TREATERS INVENTORY

The purpose of wood preserving is to extend the life of wood products, particularly those used in the construction, railroad and utilities industries, by providing long-term protection from the damaging effects of the weather, fungi, insects and marine borers. The preservation process involves the penetration of a preservative solution, usually under pressurized applications, into the timber. The most common preservative solutions used include chromated copper arsenate (CCA), copper napthenate, creosote and pentachlorophenol. Past mismanagement of these preservatives at woodtreating facilities has caused significant contamination of soil and groundwater at some sites. The contamination is generally caused by excess preservative from the treated wood being allowed to drip directly onto the ground. These chemicals contaminate the soil and groundwater, with the potential of being transported a considerable distance from the site.

As of June 30, 2002, 69 sites are listed on the Wood Treaters Inventory. Of these 68 sites, seven are actively being investigated by the SEU, six are actively being investigated by the EPA, 15 are undergoing some form of remediation, monitoring or removal activities, 18 have completed investigations, 16 are pending evaluation by the SEU, and the remaining 22 are pending evaluation by the EPA. If you have any questions regarding these sites or wood treaters in general, please contact the HWP's Superfund Section at (573) 751-8629.

The following list only includes sites where a wood treater has been confirmed at that location; suspected sites that have not been confirmed or assessed are not listed in this document.

Wood Treaters			
Site (Alias)	Address	County	Status
A & R Oak Fencing (FF & 32)	1505 State Hwy 32	Dallas	SEU investigation planned
A.K. Gibbon Lumber (Gibbon Lumber)	1301 West 13 th St.	Jackson	SEU investigation planned
Arneson Timber Company	522 Industrial Dr.	Crawford	Listed on Registry-Remedial Action ongoing
Berry Wood Products	7307 Hwy 67 South	Madison	Cooperative Program cleanup pending
Bunker Post Co.	W. Hwy 72	Reynolds	EPA NFAP
CC Woodtreating Co.	3340 State Rt. CC	Howell	SEU investigation planned
Central Creosoting Co.	Hwy 60 W	Wright	EPA NFAP
Coats Wood Industries	7177 Hwy Z	Texas	SEU investigation ongoing
Cook Lumber (John Cook Lumber)	Highway 21 N	Reynolds	Remedial Action ongoing
Curt Bean Lumber Co., Inc.	1320 E. Old Lexington Rd.	Jackson	EPA investigation ongoing
Dora Post & Lumber Co.	Hwy 181	Ozark	SEU investigation ongoing
El Dorado Springs Wood Products	509 W. Fields Blvd.	Cedar	SEU NFAP
Feeler Lumber Co. (Hayes Lumber Co.)	2021 Rolla Rd.	Maries	EPA investigation planned
Hammond Post Site	14112 Hwy 63 North	Texas	Remedial Action ongoing
Harris Sawmill (Harris Lumber)	8198 Pridemore Rd.	Wright	EPA NFAP
Hough Lumber Co.	25239 Evanston Rd.	Laclede	SEU investigation ongoing
Houston Wood Treatment Plant	16841 Oak Hill Rd.	Texas	Remedial Action pending
International Paper Co. - Joplin	3202 E. 20th St.	Jasper	Listed on Registry-Remedial Action ongoing
J & J Woodtreating	Old Hwy 60 East	Shannon	SEU investigation planned
Jennings Former Wood Treating Facility	15324 English Rd.	Laclede	SEU NFAP

Site (Alias)	Address	County	Status
Kerr-McGee Chemical Corp. - Springfield	2800 W. High St.	Greene	Remedial Action ongoing
Kerr-McGee Chemical Corp. - Kansas City	2300 Oakland	Jackson	Remedial Action ongoing
Koppers Co., Inc. Forest Products Div. (Beazer East)	6740 Stadium Dr.	Jackson	Remedial Action ongoing
Koshkonong Wood Inc.	Hwy 63	Oregon	EPA NFAP
Lewis & Clark Sawmills	14400 Hwy 67	St. Charles	EPA investigation ongoing
Massie Pole Yard, Inc.	Hwy 21 and N. Hwy 60	Carter	EPA investigation ongoing
Miller Wood Treating (Revelle Wood Treating)	13495 Hwy 38	Texas	SEU investigation planned
Missouri Tie & Timber, Inc.	W. Hwy 72	Reynolds	EPA investigation planned
Missouri Woodtreating Co., Inc.	N. Hwy 137	Texas	EPA investigation planned
Moberly Wood Treating	RR 3	Randolph	EPA NFAP
NE Missouri Power Coop.	Business Route 61 North	Marion	SEU investigation planned
Ozark Post & Lumber, Inc. (Timber Products, Inc.)	Old Hwy 60 East	Shannon	EPA investigation planned
Ozark Post & Pole	Rt. 2	Howell	EPA NFAP
Peppers Lumber Co.	30695 State Hwy 5	Laclede	SEU investigation planned
Poplar Bluff Post Co.	Rt. 1 Box 148	Butler	SEU NFAP
R.J. Post Plant	1698 Hwy 38	Webster	SEU investigation planned
Rogers Post & Lumber Co.	Hwy 8	Crawford	EPA NFAP
Scott Lumber Co., Inc.	PO Box 36	Oregon	EPA NFAP
Scott Post, Inc.	13211 Hwy 60 West	Butler	EPA investigation planned
Scott Tie Co.	Doe Run Valley Rd.	Reynolds	EPA NFAP
Sees Post & Lumber	Rt. 3 Box 122	Webster	EPA investigation ongoing
Sentinel Wood Treating Co., Inc.	420 NW 12th St.	Douglas	Listed on Registry-Remedial Action ongoing
Shipley Woodtreating Co.	Rt. 1 Box 3930	Ozark	SEU investigation ongoing
Sien Lumber	29289 Pacific Dr.	Laclede	EPA investigation ongoing
Sikes Post & Lumber Co.	Rt. 1 Box 18B	Polk	SEU investigation ongoing
Smith Flooring, Inc. - Cabool	Hwy 60 West	Texas	Voluntary Cleanup Program cleanup ongoing
Smith Flooring, Inc. - Houston	N. Hwy 63	Texas	Voluntary Cleanup Program cleanup ongoing
Smith Flooring, Inc. - Mountain View	Hwy 60 West	Howell	Voluntary Cleanup Program cleanup ongoing
Smith Lumber	18432 Dillworth Rd.	Laclede	SEU NFAP
Southeast Wood (Georgia Pacific; International Paper Co.)	Walker Rd. & Hwy 58	Cass	VCP NFAP - Cleanup Complete
Slater Wood Preserving (Universal Forest Products)	210 Timber Lane	Saline	SEU investigation planned
St. Louis Flameproof & Wood Preserver	8011 S. Broadway	St. Louis City	EPA investigation ongoing
Stratman Lumber	County Rd. 331	Maries	Listed on Registry - EPA NFAP - EPA Cleanup Complete
Sullens Lumber & Treated Post (Ozark Lumber)	310 W. Pulaski St.	Pulaski	SEU NFAP
Texas County Post	Anderson Ln.	Texas	SEU investigation planned
Thomasville Wood Products	Hwy 99 & 160	Oregon	Removal Action Pending
Timber Industries (Salem Pin Pole)	Hwy 19 North	Dent	EPA NFAP

Site (Alias)	Address	County	Status
Universal Forest Products (Southwest Co. Inc)	2600 Precision Dr.	Cass	EPA investigation planned
Winona Post Company, Inc.	Old Hwy 60 West	Shannon	EPA NFAP
Wise, Warren Inc. - Cairo (Warren Wise/Cairo Treating Pit)	PO Box 148	Randolph	SEU investigation ongoing
Wise, Warren Inc. - Houston (Warren Wise Inc./Houston Chem.)	Rt. 7 Box 148	Texas	EPA NFAP
Zimmerman Sawmill (A. Zimmerman Treating)	191 Coatney Rd.	Dallas	SEU investigation planned

NFAP = No Further Action Planned
 SEU = Missouri Department of Natural Resources' Site Evaluation Unit
 EPA = U.S. Environmental Protection Agency

CLEANUPS

RESPONSIBLE PARTY CLEANUPS

Parties who are responsible for releases of hazardous substances and who contributed to uncontrolled hazardous waste disposal sites are encouraged to undertake remedial action using their own resources. Under CERCLA/SARA, responsible parties could include the generators of the hazardous waste, those who transported the waste, those who accepted the waste, and past and present landowners. Responsible parties wishing to conduct a remedial action must have their plan approved by state and federal agencies. Their cleanup activities are monitored closely by state or federal authorities to assure that cleanup goals are met.

Responsible party cleanups can occur pursuant to CERCLA or the state Hazardous Waste Management Law. Responsible parties pay for most cleanups that take place under CERCLA authority and nearly all cleanups that are conducted under state authority.

State Cooperative Program

The state recently began a new program to allow cooperative responsible party cleanups under state authority. The initiative is termed the Cooperative Program and is intended as an alternative for sites that otherwise would be referred to the EPA Remedial or Removal programs. Participants are allowed to perform site characterization, evaluation and cleanup activities in a streamlined manner. The responsible parties pay all state oversight costs and are subject to penalties for non-performance.

Registry Consent Agreements

Some owners whose property is proposed for the Registry would prefer to clean up a site to Class 5 rather than allow it to be placed on the Registry. Site owners or PRPs wishing to clean up a site may negotiate a Registry consent agreement. The consent agreement establishes a schedule and specific responsibilities for the completion of site investigation and remediation by the property owner or responsible party. All activities are completed with state oversight. Upon successful completion of site remediation, the department withdraws its Registry action.

As of November 1, 2002, 13 sites were undergoing responsible party cleanup under state Registry consent agreements.

***CONSENT AGREEMENT SITES IN MISSOURI* (Alphabetical)**

1. Bemis 1295 N. Highway Dr. Fenton, MO 63026	4. Joplin Pipe & Steel 506 Tyler Ave. Joplin, MO 64801
2. Emerson Electric 8100 W. Florissant St. Louis, MO 63136	5. Kellwood 202 Industrial Dr. New Haven, MO 63068
3. Folk Avenue 7882 Folk Ave. Maplewood, MO 63143	6. Knapheide Manufacturing Co. U.S. Highway 24 West Quincy, MO 63471

Consent Agreement Sites (continued)

7. Litton Systems 4811 W. Kearney St. Springfield, MO 65803	11. SKF Foundry 1801 W. Main St. Washington, MO 63090
8. Orbco (Orscheln) 1177 N. Morley Moberly, MO 65270	12. StarBrite 510 Tyler Ave. Joplin, MO 64801
9. PerkinElmer (EG&G) Missouri Metals 9970 Page Blvd. Overland, MO 63132	13. Toastmaster 1301 N. Osteopathy Kirksville, MO 63501
10. Ramsey/TRW 14161 Manchester Rd. Manchester, MO 63011	

FEDERAL CLEANUPS

Where responsible parties are unwilling or unable to initiate cleanups, the EPA may undertake cleanup actions under authority of CERCLA/SARA. When the cleanup action occurs at an NPL site, the action is termed a remedial action and involves a complete characterization of the site (remedial investigation), a feasibility study, an engineering design, and the cleanup itself. The federal Superfund may also be used to clean up sites that are not on the NPL but pose immediate threats to human health and the environment. Called "removals," these actions do not require the same degree of characterization and design as do remedial actions. The EPA will attempt to recover Superfund money spent on remedial actions and removals from PRPs when identified.

STATE CLEANUPS

The department also may undertake site cleanups, but only after making a reasonable effort to secure agreement from persons responsible for disposal to pay for the necessary work. If the department does not make an effort to get PRPs to pay for the cleanup, state Superfund dollars cannot be used. Should the department take action at a site, it must make a reasonable effort to recover all funds expended, either through agreements with the PRPs or through litigation.

REGISTRY CLEANUPS

The following table lists sites that were removed from the Registry, or for which Registry action was suspended due to cleanup.

	Site	County	Date Registered	Date Cleaned Up
1.	Abrahamsen Property	Jefferson	6/14/1984	8/1986
2.	Acetylene Gas	St. Louis	3/10/1987	12/1995
3.	Armco (North End Landfill)	Jackson	NA	12/1992
4.	At&T	Jackson	NA	8/1992
5.	Baxter Garden Center	St. Louis	1/1/1984	5/1996
6.	Bliss Farm Road	Phelps	1/1/1984	10/1991
7.	Boulder Valley Campground	St. Francois	NA	5/1985
8.	Branson Quarry	Taney	1/1/1984	1/1990
9.	Bristol Steel	St. Louis	NA	4/1991

	Site	County	Date Registered	Date Cleaned Up
10.	Bubbling Springs Ranch	Jefferson	1/3/1985	1/1989
11.	Bull Moose Tube Company	Franklin	Proposed Registration Dropped Without Prejudice 2/5/1998	11/1996
12.	Buffalo Shell Roxdale Pump Station	Dallas	NA	5/1995
13.	Burlington Northern Railroad – Cottrell Property	Crawford	3/25/1996	8/2000
14.	Burlington Northern Railroad – Richards Property	Crawford	Proposed Registration Dropped Without Prejudice 2/9/2000	8/2000
15.	Burlington Northern Railroad – Wright Property	Crawford	4/11/1996	8/2000
16.	Cashel Residence	Jefferson	NA	10/1985
17.	Community Christian Church	St. Louis	Proposed Registration Dropped Without Prejudice 2/5/1998	10/1996
18.	Cooksey's Barrel	Franklin	6/14/1984	4/1993
19.	Craft World International	Greene	Proposed Registration Dropped Without Prejudice 6/20/1989	6/1989
20.	Cooney Equipment	New Madrid	NA	5/1994
21.	Defiance Dump Site #1	St. Charles	NA	1/1984
22.	Detroit Tool	Laclede	Proposed Registration Dropped Without Prejudice 12/22/1995	12/1995
23.	Dexter Plating	Stoddard	NA	8/1992
24.	East North Avenue	St. Louis	Proposed Registration Dropped Without Prejudice 2/5/1998	10/1996
25.	East Texas Motor Freight	St. Louis	Proposed Registration Dropped Without Prejudice 2/5/1998	9/1996
26.	Eggeman Drum	Washington	3/16/1987	4/1990
27.	Erwin Farm	Lawrence	1/3/1984	10/1985
28.	Fire Trail 11-H	Crawford	NA	6/1984
29.	Frontenac (Bliss Tank Farm)	St. Louis	2/8/1990	1/1996
30.	General Electric/Enterprise Park	Greene	NA	1/1988
31.	Generally Hauling	Franklin	10/17/1987	11/1999
32.	Great Lakes	St. Louis City	Proposed Registration Dropped Without Prejudice 6/27/1988	1/1988
33.	Grimco Signs	Gasconade	NA	9/1989
34.	Hamill Transfer Co.	St. Louis City	9/3/1985	6/1996
35.	Hardt Road	St. Louis	2/22/1985	12/1987
36.	Hellwig Fruit Stand	St. Louis	NA	8/1992
37.	Hendren Salvage Yard	Boone	NA	7/1988
38.	Jacksonville Satellite Dish Site	Randolph	NA	7/1993
39.	Kem-Pest	Cape Girardeau	Proposed Registration Dropped Without Prejudice 10/26/2000	10/2000
40.	Kramer Site	St. Francois	Proposed Registration Dropped Without Prejudice 4/10/1997	4/1997
41.	Larry Lee Drum Site	Ray	NA	4/1994
42.	McArthur Drive Landfill	Buchanan	Proposed Registration Dropped Without Prejudice 4/4/1985	4/1985
43.	Manchester United Methodist Church	St. Louis	1/1/1984	9/1989

	Site	County	Date Registered	Date Cleaned Up
44.	Monsanto-Queeny	St. Louis	Proposed Registration Dropped Without Prejudice 4/10/1997	5/1985
45.	Stout/Romaine Creek portion of Minker Stout/Romaine Creek Site	Jefferson	6/14/1984	2/1997
46.	Modern Iron And Metals	St. Louis	8/17/1987	8/1991
47.	Mid-State Motor Carriers (portion of Starbrite Site)	Jasper	Proposed Registration Dropped Without Prejudice 4/27/2000	4/2000
48.	Motoroloa, Old	Jasper	Proposed Registration Dropped Without Prejudice 6/29/2000	6/2000
49.	Neosho Wastewater School Tank	Newton	1/1/1984	6/1986
50.	Nevada Landfill	Vernon	NA	7/1986
51.	Parkhurst Mfg. Co.	Pettis	NA	11/1983
52.	Payne Residence	Jefferson	1/1/1984	8/1986
53.	Piazza Road & Adjacent Properties	Phelps	1/1/1984	6/1989
54.	Pigeon Hill Landfill - New	Buchanan	Proposed Registration Dropped Without Prejudice 4/4/1985	4/1985
55.	Plattco Landfill – Douglass property	Platte	Proposed Registration Dropped Without Prejudice 7/15/1987	7/1987
56.	Private Drive Off Highway 100	St. Louis	6/14/1984	6/1987
57.	Quail Run	Jefferson	Proposed Registration Dropped Without Prejudice 3/17/1989	12/1986
58.	Reeves Property	Madison	Proposed Registration Dropped Due to Incorrect Legal Description 1/28/1994	1/1994
59.	Roscoe Property	St. Clair	Proposed Registration Dropped Without Prejudice 4/27/2000	4/2000
60.	Ray County Drum Site	Ray	NA	5/1985
61.	Robbins Property	Jefferson	6/14/1984	8/1992
62.	Romaine Creek	Jefferson	1/1/1984	10/1989
63.	Rosalie Site (Ellisville)	St. Louis	9/21/1984	9/1986
64.	Rusha Farm	Lawrence	1/3/1984	10/1985
65.	Southwestern Bell/Eureka	St. Louis	Proposed Registration Dropped Without Prejudice 4/27/2000	10/1996
66.	Saddle & Spur Stables	Jefferson	1/15/1984	7/1990
67.	Saline Creek Site	Jefferson	NA	6/1984
68.	Sandcut Rd. (Lacy Manor)	Franklin	6/14/1984	11/1996
69.	Shenandoah Stables	Lincoln	1/3/1984	3/1989
70.	Solid State Circuits -Boonville	Greene	Proposed Registration Dropped Without Prejudice 8/26/1996	8/1996
71.	Sontag Road Swim Club & Fire Station (Castlewood)	St.Louis	1/3/1984	11/1987
72.	Southern Cross Lumber	St. Louis	2/22/1985	12/1996
73.	Stephens Farm	Newton	5/14/1991	1/1998
74.	Sullins Residence	Jefferson	NA	10/1985
75.	Talley Farm	Barry	NA	11/1985

	Site	County	Date Registered	Date Cleaned Up
76.	Timberline Stables	Callaway	1/1/1984	2/1989
77.	Times Beach	St. Louis	1/1/1984	8/1997
78.	Tipton/Laroche	Pemiscot	NA	10/1994
79.	TSI Mulberry Hill	Jefferson	1/1/1984	8/1990
80.	TWA Ground Operations Center	Platte	Proposed Registration Dropped Without Prejudice 6/14/2001	6/2001
81.	Vista Drum Site	St.Clair	NA	6/1994
82.	Wheeler Property	Pettis	NA	7/1984

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HAZARDOUS WASTE REMEDIAL FUND STATEMENT OF REVENUES, EXPENDITURES AND CHANGES IN FUND BALANCE FISCAL YEAR 2002

The Missouri "Superfund Law" (Section 260.446, RSMo Missouri Hazardous Waste Management Law, see Appendix C) requires the department to provide a full account to the General Assembly, Governor, and the Missouri Hazardous Waste Management Commission each January 1 regarding the Hazardous Waste Remedial Fund.

Expenditures from the fund are used for site cleanups, investigation of potential sites, Registry actions, and the administrative costs of the program.

An account of the Hazardous Waste Remedial Fund is listed on the following pages.

**HAZARDOUS WASTE REMEDIAL FUND STATEMENT OF
REVENUES, EXPENDITURES, AND CHANGES IN FUND BALANCE
FOR THE YEAR ENDED JUNE 30, 2002 (FY 2002)**

Revenues - Sources (Notes 2 and 4)

Taxes	1,597,853
Interest	103,944
Recovery Costs and Cost Reimbursements	667,438
Penalties and Court Settlements	0
Other Miscellaneous	<u>309</u>
Total Revenues*	2,369,543

Expenditures - Recipients (Notes 3, 4, 5, and 6)

Personal Services	860,298
Medical, Laboratory, and Technical Services	252,421
Office and Communication	16,759
Travel and Vehicle	37,104
Data Processing	2,068
Dept. of Health Operations and Support	159,750
Medical and Laboratory Equipment and Supplies	7,589
Physical Plant	61,044
Professional Development	12,017
Other Expenses	53,175
Attorney General Expenditures	<u>226,229</u>
Total Expenditures*	<u>1,688,453</u>

Excess of Revenues over Expenditures

681,091

Operating Transfers Out (In) (Note 4)

Miscellaneous Transfer	7,883
State Retirement Contribution	136,974
Cost Allocation Fund Transfers	508,754
OASDHI Contribution	81,390
Rent Transfers	58,918
MO Consolidated Health Care Plan	128,364
Deferred Compensation Incentive Plan - Match	7,574
Worker's Compensation Transfers	<u>1,648</u>
Net Operating Transfers*	<u>931,504</u>

Excess of Revenues over Expenditures and Transfers Out

(250,414)

Fund Balance, July 1, 2001

2,829,963

Retained Earnings (Note 4)

84,385

Adjustment to July 1, 2001 Fund Balance (Note 7)

(464)

Fund Balance, June 30, 2002

2,663,469

The NOTES TO THE STATEMENT OF REVENUES, EXPENDITURES, AND CHANGES IN FUND BALANCE are an integral part of this statement.

*Any difference of \$1 in the subtotals and totals is due to rounding.

**MISSOURI DEPARTMENT OF NATURAL RESOURCES
NOTES TO THE STATEMENT OF REVENUES, EXPENDITURES,
AND CHANGES IN FUND BALANCE
FOR THE YEAR ENDED JUNE 30, 2002 (FY 2002)**

Note 1 - This financial statement is presented on a cash basis of accounting which recognizes revenues when available and measurable and expenditures when incurred according to the State of Missouri Financial Management and Control System. Lapsed period expenditures for the state fiscal year ended June 30, 2002, and are not included.

Note 2 - Penalties and court settlements include monies collected as restitution or through court settlements.

Note 3 - Fund expenditures include expenditures from the Missouri Department of Health appropriations 7704-Personal Services and 7705-Expense and Equipment in the amounts of \$129,735 and \$30,015 respectively.

Expenditures from the Attorney General's Office appropriations 6265-Personal Service and 6626-Expense and Equipment in the amounts of \$216,520 and \$10,165 respectively.

Note 4 - Definitions:

Cost Allocation Fund Transfers - Includes appropriated transfers to the Department of Natural Resources Cost Allocation Fund to cover a proportionate share of the department's administrative costs.

Data Processing - Includes expenditures related to computers, data processing, and maintenance of computer equipment.

Deferred Compensation Incentive Plan Employer Match - Transfer of cash from any fund to the Missouri State Employees' Deferred Compensation Incentive Plan Administration Fund (0706).

Interest - Includes interest earned on the fund balance as authorized in Section 260.480, RSMo.

Medical, Laboratory and Technical Services - Includes expenditures related to sampling, lab, and chemical analysis at hazardous waste sites as part of a site investigation or study and contract services. Analysis also includes research work as it relates to analysis of samples. Analysis is conducted typically to determine the type and extent of contamination. In addition, expenditures for the medical monitoring of state employees involved in the state's Superfund programs who potentially are exposed to hazardous chemicals are included.

Medical and Laboratory Equipment and Supplies - Includes all medical and laboratory supplies and equipment purchased.

OASDHI Contribution - Based on salaries paid.

Office and Communication - Includes postage and telephone expenditures, printing and binding, office equipment, and communication equipment.

**MISSOURI DEPARTMENT OF NATURAL RESOURCES
NOTES TO THE STATEMENT OF REVENUES, EXPENDITURES,
AND CHANGES IN FUND BALANCE
FOR THE YEAR ENDED JUNE 30, 2002 (FY 2002)**

Note 4 - Definitions continued:

Other Expenses - Miscellaneous expenditures and refunds including depreciation expenses.

Other Miscellaneous Revenue - Includes vendor refunds, other refunds, literature sales, uncashed (outlawed) checks.

Physical Plant - Includes utilities, maintenance and repair, and housekeeping supplies.

Recovery Costs and Cost Reimbursements - Recovery costs include money recovered for costs incurred by the state. Cost Reimbursements represent money received from other governments for reimbursement of costs incurred by the state.

State Retirement Contribution - Based on salaries paid.

Taxes - Includes tax revenue collected under authority of Section 260.479, RSMo (category tax - taxing authority became effective 1/1/87).

Travel and Vehicle - Includes expenditures related to travel to sites, to attend meetings, for vehicles, and vehicle maintenance.

Professional Development - Includes educational supplies, library supplies, memberships, publications, subscriptions and professional development expenditures.

Retained Earnings - Includes adjustments made to add Net Book Value (Asset value less Accumulated depreciation) of fixed assets owned by the fund.

Note 5 - The Missouri Department of Natural Resources has entered into cooperative agreements with the U.S. Environmental Protection Agency (EPA). The cooperative agreements fund the cleanup of EPA Superfund Sites. The Hazardous Waste Remedial Fund is used to supply the 10 percent match requirements for these activities.

Note 6 - Superfund State Contracts have been established between the Missouri Department of Natural Resources and the EPA. These contracts call for the cleanup of the Minker/Stout/Romaine Creek Site in Jefferson County, the Shenandoah Stables Site, and the Kem-Pest site in the amounts of \$550,000, \$367,600, and \$375,391 respectively.

There are additional Superfund contracts with liability to the state against this fund for the state's 10 percent share of remedial action work at Times Beach and for work performed at the Jasper county site. A reliable dollar estimate is not available at this time.

The Missouri Department of Natural Resources has entered into a contract to conduct a Remedial Investigation/Feasibility Study (RI/FS) at the Newton County TCE (Trichloroethylene) contamination site. The total cost for completing the RI/FS is estimated to be between \$1 million to \$1.5 million.

**MISSOURI DEPARTMENT OF NATURAL RESOURCES
NOTES TO THE STATEMENT OF REVENUES, EXPENDITURES,
AND CHANGES IN FUND BALANCE
FOR THE YEAR ENDED JUNE 30, 2002 (FY 2002)**

Note 7 - The June 30, 2001 Fund Balance reported on the Statement of Revenue, Expenditures and Changes in Fund Balance for the Fiscal Year Ended June 30, 2001 was overstated by \$464 due to payroll errors. The adjustments made in March of 2002 (fiscal year 2002) were for FY 2001. The current fund balance has been reduced by \$464 to offset this adjustment.

REGISTRY OF CONFIRMED ABANDONED OR UNCONTROLLED HAZARDOUS WASTE DISPOSAL SITES FISCAL YEAR 2002

An updated list of sites currently on the Registry is available at the department's Internet address, www.dnr.state.mo.us, under hazardous waste topics.

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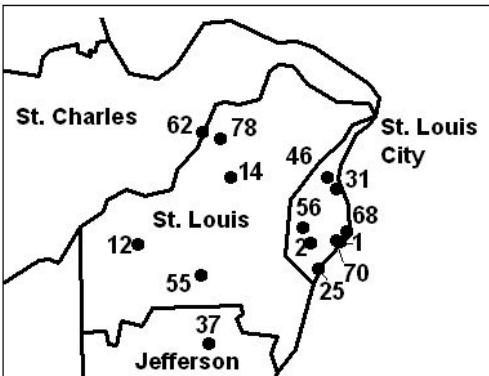
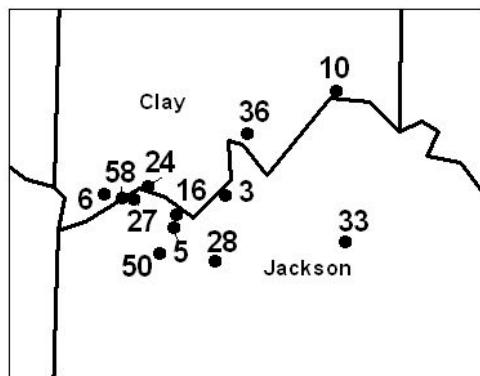
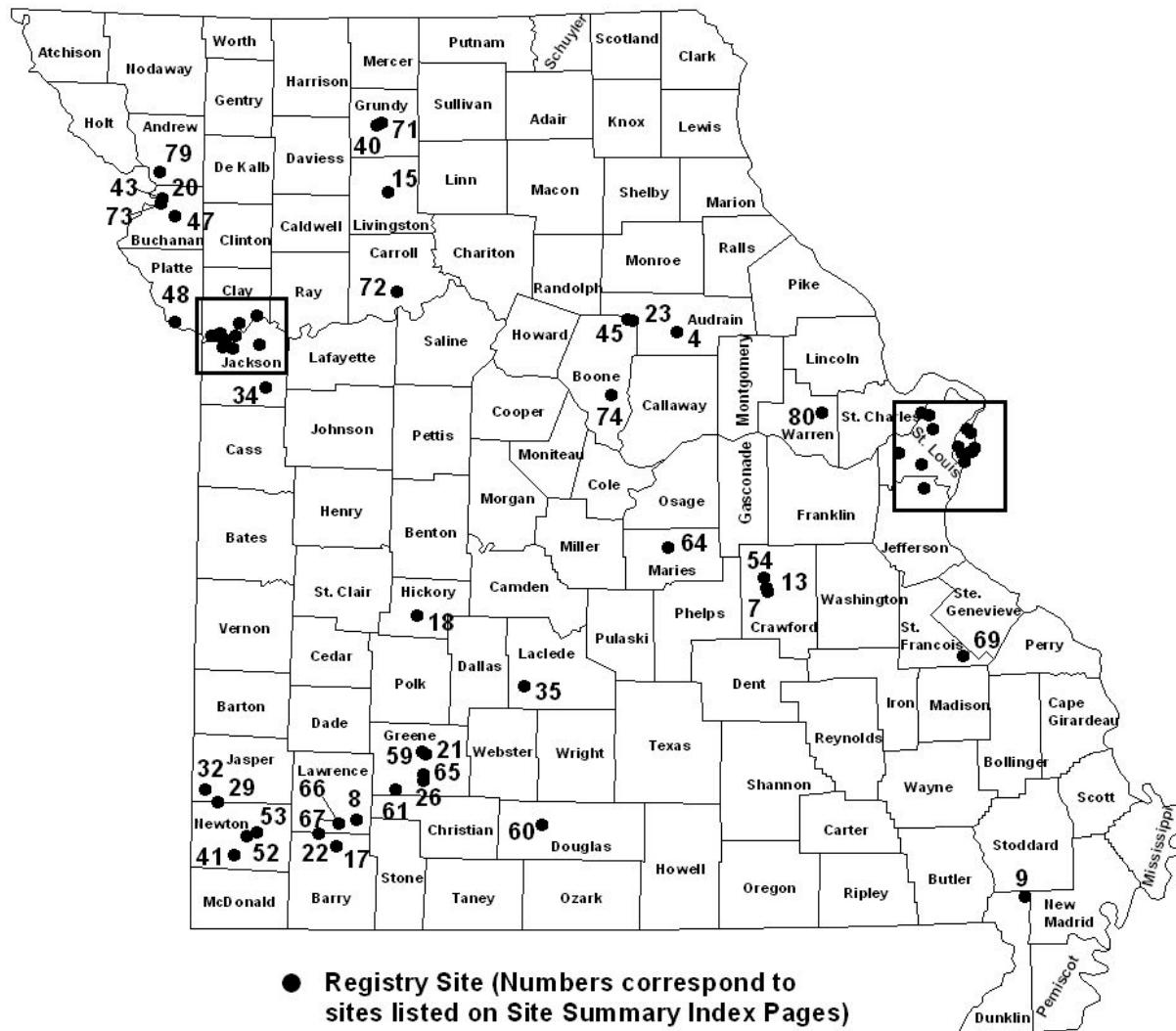
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Registry Site Location Map FY 2002



Missouri Department of
Natural Resources
Air and Land Protection Division
Hazardous Waste Program

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CLASS 1 SITES

Armour Road



Site Name: Armour Road

Classification: Class 1

Date of Placement: May 22, 1997

Address: 2251 Armour Road, North Kansas City, Clay County, Missouri, Sec. 13, T. 50N, R. 33W North Kansas City Quadrangle. 39° 08'42" North, 94°33'21"

Present Property Owners: KC 1986 Limited Partnership, Donald E. Horne, Principal Partner

Lead Agency: EPA

Waste Type: Arsenic, antimony, pentachlorophenol, 2,4-dichlorophenoxyacetic acid (2,4-D), and other contaminants resulting from herbicide blending operations (including benzo(a)pyrene, cadmium, dichlorophenol, lead, mercury, PCP, selenium, thallium, 2,4,5-trichlorophenoxyacetic acid (2,4,5-T) and 2,4,6-T)

Quantity: The quantity of contaminated building material is unknown, but is probably in the range of hundreds of cubic yards. The quantity of contaminated soil is estimated at 31,500 cubic yards. The quantity of

contaminated groundwater is unknown but may range into the billions of gallons.

Site Description:

From 1943 to 1983 this property was the location of a herbicide blending facility that used the following chemicals at the site: arsenic; pentachlorophenol (PCP); sodium chlorate; 2,4-dichlorophenoxyacetic acid (2,4-D); and 2,4,5-trichlorophenoxyacetic acid (2,4,5-T). Herbicides were used to control weed growth along railroad right-of-ways. The facility has been inactive since 1986.

The soil is contaminated with extremely high levels of arsenic, antimony, PCP, and lesser levels of numerous other substances. Groundwater at the site is also contaminated. This contamination is believed to be a result of spills and general operational practices at the facility. The 25,000 square foot building on site is contaminated.

The site, which covers an area of 1.8 acres, is located between an industrial area and a residential neighborhood. South of the property are rail yards, warehouses and industrial facilities. The site is adjacent to a commercial development zone. Homes are about 1,200 feet away.

Environmental Problems and Areas of Concern Related to Site:

The Missouri River alluvial aquifer that underlies the site has been contaminated. The Missouri Department of Natural Resources conducted sampling in June 1990 as part of a site investigation. The analytical results documented the presence of characteristic hazardous waste in the soil and groundwater. The analyses also documented the presence of hazardous waste constituents in the groundwater above Missouri Department of Health and Senior Services' (DHSS) safe levels set for the site. Wells near the site draw water from the aquifer for industrial use. A well, located 0.25 miles to the southeast of the site, was removed from service due to arsenic contamination.

The 2002 annual Registry inspection noted that the majority of the site is covered with a concrete pad that has numerous cracks with weeds. The southwest portion of the site has a drainage area that appears to have soil erosion.

Remedial Actions at Site:

In April 1996, the U.S. Environmental Protection Agency (EPA) implemented a time-critical removal action. The removal action included covering exposed soil on the property with geofabric and gravel and placing a 6-foot, chain-link fence at the south and east borders of the site. The geo-liner that was placed over the exposed soil is in poor condition in certain areas. In December 1996, the EPA entered into an agreement with one of the Potentially Responsible Parties (PRPs) to conduct an Engineering Evaluation/Cost Analysis (EE/CA) of available soil-cleanup alternatives. A treatability study that evaluated electrokinetics for removing arsenic from soils resulted in rejection of that technology as a cleanup alternative. The site was added to the EPA's National Priorities List in May 1999. A removal action including soil excavation and disposal and building demolition should be initiated during fiscal 2003.

In May 1997, the site owner, Kansas City 1986 Limited Partnership, was referred to the

Attorney General's Office for enforcement of Resource Conservation and Recovery Act violations.

General Geologic and Hydrologic Setting:

The Armour Road Site is located on an alluvial point bar on the north shore of the Missouri River. The site is characterized by 17 to 22 feet of silty clay interbedded with fine-grained sand and silt lenses. These materials are underlain by fine- to medium-grained sand to a depth of at least 55 feet. This sand interval within the Missouri River alluvial aquifer is saturated from a depth of 25 feet. Due to the thick alluvial cover, bedrock is not exposed at the site. However, the underlying bedrock is of the Pennsylvanian-age Kansas City Group, which is 60 to 85 feet below the ground surface.

Groundwater at the site flows southeast through the permeable sand, discharging to the Missouri River. The Missouri River alluvial aquifer is widely used in this area.

Public Drinking Water Advisory:

Five alluvial wells serving North Kansas City are about one mile west of the site. Eleven alluvial wells and an intake on the Missouri River serving Kansas City are about 1.5 miles northwest. Five alluvial wells and one proposed well serving Gladstone are 2.5 miles to the northwest. All of these wells are between 100 and 150 feet deep. The city of Independence has 35 active wells and six proposed wells about eight miles east of the site. All 62 of these wells are between 100 and 150 feet deep. None of these wells are impacted by the Armour Road Site. However, the site impacts groundwater that is a potential drinking water resource in this area where the alluvial aquifer is highly used.

Health Assessment:

Contaminants found include the following: antimony, arsenic, mercury, lead, selenium, thallium, benzo(a)pyrene, cadmium, 2,4-D, 2,4,5-T, 2,4,6-T, dichlorophenol and PCP. The most critical contaminants are arsenic, PCP and 2,4-D. Arsenic concentrations were found in soil and groundwater at 121,000 parts per million (ppm) and 2,060 ppm,

respectively. PCP and 2,4-D were found in soil at 250 ppm and 258 ppm, respectively.

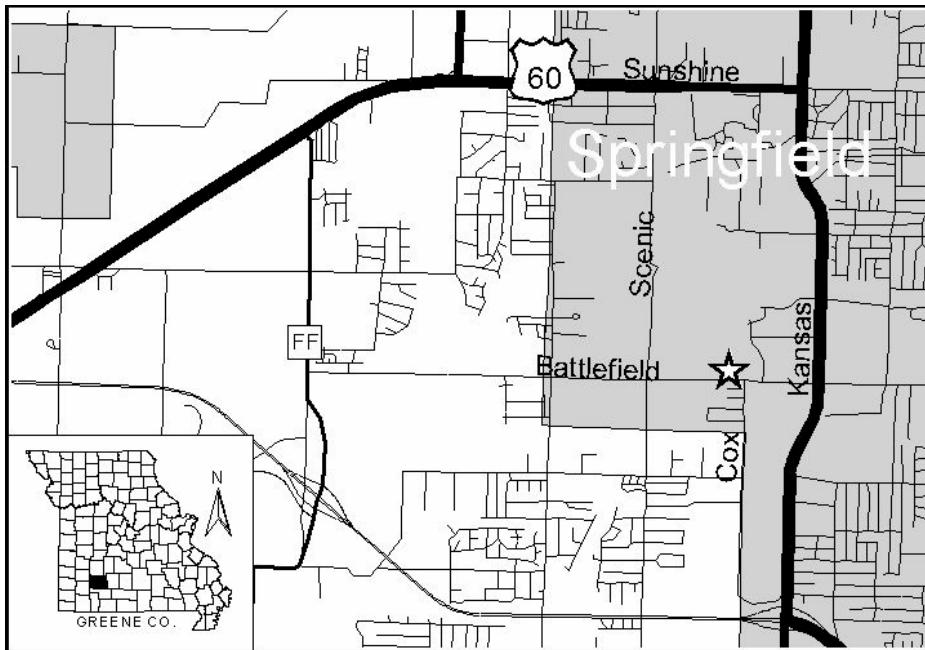
Arsenic is a known human carcinogen. Some of its noncarcinogenic effects include lung irritation, decreased red and white blood cell production, blood vessel damage, liver and kidney damage, anemia, peripheral nervous system damage, and skin lesions. Effects of 2,4-D and PCP include gastrointestinal irritation and negative effects on the liver and kidneys.

Human footprints and vandalized fencing indicate that humans have been exposed within recent years. The DHSS's investigation has included conversations with individuals who admit to spending time on the site.

No known private water wells are being used within the vicinity of the site. Due to the high levels of arsenic; 2,4-D; PCP; and other hazardous substances, this site poses a significant health threat. If the gravel and the polypropylene fabric that are covering the soil become compromised, as they have in the past, human exposure to the chemicals could occur at levels of health concern. The adjacent lumberyard has closed, leaving the area attractive to trespassers and vandals.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

HCI Chemtech-Springfield



Site Name: HCI Chemtech-Springfield

Classification: Class 1

Date of Placement: March 26, 1999

Address: 2235 W. Battlefield Road,
Springfield, Greene County, Missouri, SE $\frac{1}{4}$,
NW $\frac{1}{4}$, Sec. 3, T.28N, R.22W, Springfield
Quadrangle

Present Property Owner: Brenntag, Inc.

Lead Agency: DNR and EPA

Waste Type: Volatile organic compounds (VOCs) (including benzene, carbon tetrachloride, 1,1-dichloroethylene, methylene chloride, tetrachloroethylene, toluene, vinyl chloride and xylene) and semi-volatile organic compounds (SVOCs)

Quantity: Not determined

Site Description:

A chemical distribution facility has operated at the site since about 1975. The site encompasses 3.75 acres in a commercial and light industrial area. Residences are located about 800 feet from the site.

On-site structures include an office, warehouse, drum rinsing building, drum storage building, storage shed, and tank farms that contain about 15 aboveground storage tanks (ASTs). During previous site operations, as many as 38 ASTs were used. These were located in containment areas with earthen floors.

Spills and drum rinsing are the probable sources of on-site contamination of soils and groundwater. The facility formerly received bulk chemicals delivered by railcar, but now receives bulk and packaged chemicals by truck only. Bulk shipments are stored in ASTs. Prior to distribution, chemicals are blended on site. Drums are rinsed and the rinse water is neutralized and discharged to the sewer system under a permit from the local sewer district. From 1975 through the mid-1980's, drums were rinsed with methylene chloride and re-painted in the northeast corner of the property.

Environmental Problems and Areas of Concern Related to Site:

The site is situated in a karst area. VOCs have been detected at concentrations above health-based screening levels in shallow groundwater at the site. In addition, 1,1-dichloroethene has been detected in soil

at concentrations above health-based screening levels.

Remedial Actions at Site:

Following a release of sodium hydroxide in September of 1995 at its Birmingham Road facility, the owner of the site, HCI Chemtech, was indicted for criminal violations of the Clean Water Act and of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). HCI Chemtech pled guilty and was placed on probation. As a special condition of this probation, HCI Chemtech was required to adopt corporate and compliance monitoring programs for each of its facilities in Missouri, including the HCI Chemtech-Springfield Site. A Compliance Agreement, entered into by HCI Chemtech, the United States Attorney's Office, the U.S. Environmental Protection Agency (EPA) and the Missouri Department of Natural Resources, effective November 7, 1998, specifies that HCI Chemtech shall investigate and characterize its sites.

During fiscal 1999, the EPA and the department approved a Remedial Investigation (RI) Work Plan for the site. During fiscal 2000, a RI was conducted. The investigation showed that contaminants in shallow groundwater have migrated off site. A high vacuum soil vapor extraction system was installed as an interim remedial action to reduce contaminants in the source area.

Brenntag, Inc., purchased HCI Chemtech in the fall of 2000. The Compliance Agreement expired in fall 2000 when HCI Chemtech's probation ended. Three monitoring wells were installed into the Springfield aquifer in July 2000. The results showed contamination in the Springfield Plateau Aquifer. The department completed an Expanded Site Inspection (ESI) in March 2001. Quarterly monitoring of groundwater is being conducted. Brenntag signed an Administrative Order on Consent (AOC) with the EPA in the fall of 2001 to perform a RI and to continue a removal action at the perched aquifer. The RI is due to start in the fall of 2002.

General Geologic and Hydrologic Setting:

The HCI Chemtech-Springfield Site is located within the Springfield Plateau portion of the Ozark Plateau physiographic province. It is situated on a highland between South Creek and an unnamed tributary of Wilson Creek.

The site is underlain by 0.5 to 2.5 feet of moderately- to highly-permeable fill composed of gravel, sand, silt and clay. The fill is underlain by 15 to 25 feet of silty, gravelly, sandy clay residuum with high permeability. The residuum is, in turn, underlain by Mississippian-age limestone. The highly-weathered limestone is very permeable, and evidence of karst features abound. For example, six known sinkholes are within one mile of the site, and 10 known springs and 24 known caves are within 4 miles.

The Mississippian-age limestones beneath the site compose an unconfined aquifer known as the Springfield Plateau Aquifer. The aquifer is about 300 feet thick in this area. Recharge of the Springfield Plateau Aquifer occurs through infiltration of precipitation. Shallow groundwater within the aquifer moves to the northwest. The Northview Formation, which is about 20 feet thick in the vicinity of the site, is present beneath the Springfield Plateau Aquifer. The Northview Formation is considered to be an aquitard, separating the overlying Springfield Plateau Aquifer from the underlying Ozark Aquifer. Typically, the Northview Formation is relatively impermeable; however, locally, the Northview may be breached by faults or boreholes, resulting in some potential for contaminant transport into the deeper Ozark Aquifer.

Public Drinking Water Advisory:

The nearest public water supply is the U.S. Medical Center, which is served by three wells 1 mile north of the HCI Chemtech facility. All public wells in the Springfield area draw water from the deep aquifer. The deep aquifer is isolated naturally from the shallow aquifer by the Northview Formation. It is vital that no open wells occur in the vicinity of the HCI Chemtech facility that would allow contamination to reach the deep aquifer.

Health Assessment:

Soil and groundwater are contaminated with methylene chloride. Other groundwater contaminants found above the public drinking water standards include: 1,1-dichloroethylene, tetrachloroethylene, toluene, benzene, carbon tetrachloride, vinyl chloride and xylene.

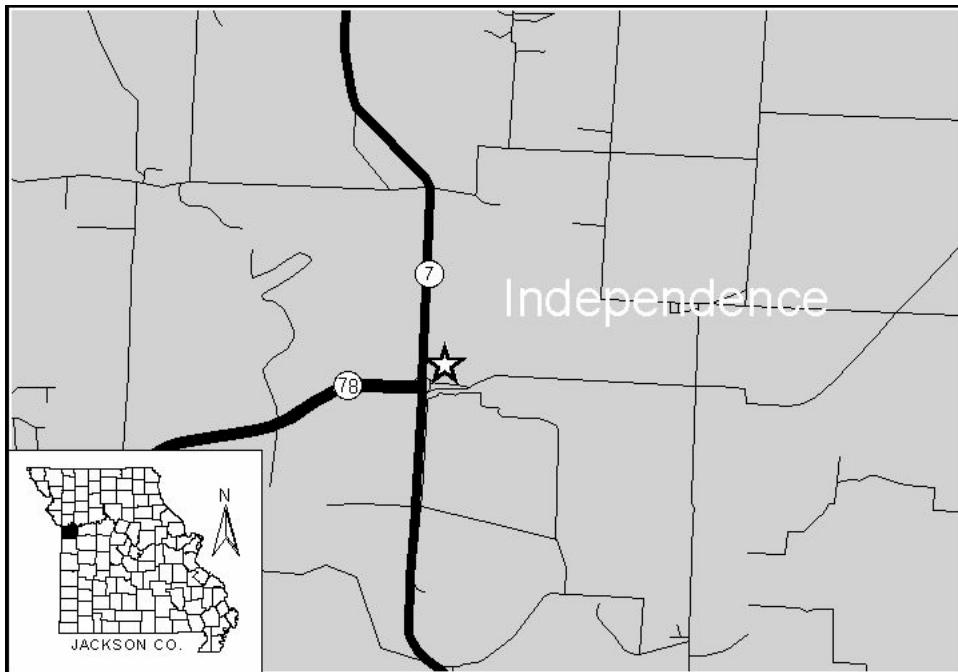
Sampling conducted in 1992 by C. Johnson Environmental detected groundwater contamination at levels many times above the public drinking water standard for several substances. Concentrations of 1,1-dichloroethylene, methylene chloride and toluene were more than one thousand times their standards. A second sampling event in

June 1995 also detected groundwater contamination above public drinking water standards.

An investigation by the Missouri Department of Health and Senior Services in January 2000 did not identify any private wells that were in use around the facility. Due to the magnitude of contaminants detected in the groundwater and the close proximity of homes, a health risk exists at this site.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Lake City Army Ammunition Plant



Site Name: Lake City Army Ammunition Plant

Classification: Class 1

Date of Placement: March 2, 2001

Address: The junction of Hwy 7 and Hwy 78 near Independence, Jackson County, Missouri.

Present Property Owner: The United States Government, Department of the Army

Lead Agency: EPA

Waste Type: Metals: antimony, arsenic, cadmium, lead

Volatile organic compounds (VOCs): trichloroethylene (TCE), tetrachloroethylene (PCE), 1,1,2-trichloroethane, vinyl chloride, 1,2-dichloroethene, 1,1,1-trichloroethane, toluene

Semi-volatile organic compounds (SVOCs): benzo(a)anthracene, benzo(a)pyrene,

benzo(b)fluoranthene, benzo(k)fluoranthene

Explosives: 1,3,5-trinitro-1,3,5-triazine (RDX), 1,3-DNB

Radioactives: depleted uranium

Quantity: Not determined

Site Description:

The Lake City Army Ammunition Plant (LCAAP) is a government-owned, contractor-operated plant that began operation in 1941. It is the largest small arms ammunition plant in the nation. Industrial operations generated large quantities of potentially hazardous waste, including solvents; explosives; heavy metals, such as barium, cadmium, chromium, lead, mercury and silver; and depleted uranium. Since 1941, the facility disposed of operational wastes in lagoons, landfills and burn pits located throughout the seven-square-mile facility. Current disposal practices are in accordance with state and federal regulations.

Fort Osage School district operates an alternative school located in Building 6 at the main entrance to the plant.

In July 2002, the Missouri Department of Natural Resources approved a change of use request to construct driving courses and a parking lot for the Metropolitan Community College's Western Missouri Public Safety Training Institute, which will occupy 41 acres in the northeastern part of the site. Sampling in this area showed no contaminants of concern detected above the department's Cleanup Levels for Missouri (CALM)

commercial/industrial screening levels except for beryllium, which was present at background levels.

Environmental Problems and Areas of Concern Related to Site:

The site is located next to the Missouri River within the flood plain. Groundwater, surface water and soil are contaminated with VOCs and heavy metals. Recent investigations indicate that contaminants have migrated off site. Significant potential exists for site contaminants to discharge to the Missouri River. Due to the presence of depleted uranium at the site, radiological issues are also a concern.

Remedial Action at the Site:

LCAAP has been divided into 33 areas of concern, which compose three operable units (OUs): the Northeast Corner OU, the Area 18 OU and the Installation-Wide OU.

Northeast Corner OU (NECOU): The NECOU consists of Areas 11, 16 and 17. The NECOU is at the Feasibility Study phase of the CERCLA process. Three distinct contaminated groundwater plumes have been identified, one of which has migrated past the facility's boundary. Off-site sampling was completed by March 1, 2002, as per an agreement reached between the Department of Justice and the property owner. VOCs were detected during this sampling event above regulatory limits. Additional characterization work necessary for the selection of the appropriate alternatives to be included in the Feasibility Study is planned for the NECOU during the next year.

Area 11 contains explosives burning grounds. Area 16 contains an abandoned landfill; oil and solvent pits; and a waste, glass, paint and solvent disposal area. The Area 16 Abandoned Landfill removal action included a cover for the abandoned landfill and installation of a leachate interceptor trench. The Army has halted the installation of the interceptor trench to re-evaluate the need based on recent groundwater sampling completed in the vicinity of the abandoned landfill. The Army is still moving forward with the installation of a partial cover over the

abandoned landfill. Area 17 contains a permitted Sanitary Landfill and two oil and solvent pits that received between one and six million gallons of waste. Groundwater samples from portions of this OU have exceeded 10 million parts per billion (ppb) VOCs.

An Interim Remedial Action (IRA) was conducted at the NECOU to perform in situ treatment of one of the contaminated groundwater plumes. The IRA consisted of placing a soil cover over the oil and solvent pits and constructing a Permeable Reactive Wall (PRW). The purpose of the soil cover is to reduce infiltration of precipitation, to promote drainage, and to reduce worker exposure to VOCs. The PRW was constructed to treat one of the contaminated groundwater plumes; however, it was not constructed in accordance with the approved design.

Preliminary sampling indicates the PRW is sufficiently impermeable to create flowing artesian conditions through upgradient monitoring wells. A hydrologic assessment, along with quarterly monitoring, is being completed at the PRW to determine the cause and possible solutions to improve flow through the wall and relieve the upgradient groundwater mounding conditions. Pump tests and slug tests were completed as part of the hydrologic assessment.

Area 18 OU: Area 18 consists of a series of oil and solvent pits and burn areas. An estimated one million gallons of waste were disposed in these pits. LCAAP was at the Remedial Design phase of the CERCLA process and scheduled to begin soil vapor extraction during the summer of 2001. Design investigation determined that the OU had not been sufficiently characterized to proceed with the remedial action. Additional characterization was completed within Area 18 during fiscal 2002. Review of the data collected established that additional work is still necessary to complete characterization, look for new source areas of contamination, re-evaluate the effectiveness of the currently selected alternative, and examine other alternatives. LCAAP is scheduled to provide an addendum to the Remedial Investigation in 2004.

The Area 18 OU has an ongoing Pump and Treat Removal Action. Currently LCAAP is extracting and treating 500 gallons per minute of contaminated groundwater. Treated groundwater is discharged to the Little Blue Valley Sewer District in accordance with permit requirements. The purpose of this removal action is to contain contaminated groundwater plumes. Recent characterization indicates extraction wells may be inducing further migration of contamination.

The lead removal action based on the Area 18 Interim Record of Decision is in the design phase. The design is based on removing all lead greater than 1,000 parts per million (ppm) in the upper 2 feet where the VOC concentration is less than 10 ppm.

Installation-Wide OU (IWOU): The IWOU encompasses the remainder of the facility (about thirty Areas of Concern). The OU is at the Remedial Investigation phase of the CERCLA process. Although this OU is at the initial stages of investigation, it is considered extremely contaminated. Known contaminants of concern include but are not limited to very high levels of VOCs, semi-volatile organic compounds, metals, explosives, radioactive materials and polychlorinated biphenyls (PCBs).

The Area 10 Sand Pile, which is part of the IWOU, originally was slated to be remediated under a Nuclear Regulatory Commission Decommissioning Plan. LCAAP underestimated the volume of material and the percentage of mixed waste by an order of magnitude. Consequently, the Army was unable to fund this action. The Nuclear Regulatory Commission is in the process of deferring regulatory oversight to U.S. EPA Region VII. The intent is to address this area under a CERCLA removal action. Major contaminants of concern include depleted uranium, lead and unexploded ordinance.

The 600-yard Bullet Catcher/Building 3A is being addressed under a Nuclear Regulatory Commission Decommissioning Plan. The contaminant of concern is depleted uranium from the manufacturing and demilitarization of fused marker rounds. Both areas are within the boundaries of the IWOU. After completion of the decommissioning, any residual

contamination will be addressed under CERCLA.

All remedial actions for the IWOU, specifically the Remedial Investigation/ Feasibility Study Report, were halted in fiscal 2002 because of funding issues.

General Geologic and Hydrologic Setting:

The site is located near the boundary between the Osage Plain and Dissected Till Plains of the Central Lowland Physiographic Province. The surface topography in the vicinity of the plant consists of rolling uplands traversed by broad stream valleys and flood plains of the Missouri River, the Little Blue River and an abandoned Missouri River channel. The majority of the active manufacturing areas are situated in the topographically flat portion of the site. Surface water draining from the western portion of the site flows to West Fire Prairie Creek and eventually into the Little Blue River. Surface drainage from the eastern portion of the site flows to East Fire Prairie Creek and eventually into the Missouri River.

At the highest elevations, limestone of the Pennsylvanian-age Kansas City Group is the predominant bedrock. Underlying side slopes, shale and claystone with lesser amounts of limestone of the Pennsylvanian-age Pleasanton Group dominate. Bedrock beneath the alluvial channel is limestone of the Pennsylvanian-age Marmaton Group. Soils overlying bedrock in the upland area range in thickness from 2 to 5 feet and typically are composed of silty clay and silt. In the central and northern parts of the installation, the soils are composed of silty clay and silt about 5 feet thick. Pleistocene-age alluvial deposits of silt, clay, sand and gravel fill the abandoned Missouri River channel to depths up to 90 feet. The bedrock below the site is not karst.

The principal aquifer of Lake City and the site area is the unconsolidated Pleistocene-age alluvial deposits, specifically the coarse sand and gravel in the lower 40 to 70 feet, located in the abandoned Missouri River channel. Lake City residents and the site use the alluvial aquifer for basic drinking and industrial water needs. The pumping of production

wells has altered the natural groundwater flow patterns. The non-pumping groundwater flow directions were reported to have been to the east and west with a groundwater flow divide near the central portion of the site. Recent potentiometric data indicate an apparent northwest-southeast groundwater flow divide located along the eastern quarter of the abandoned Missouri River channel. West of the divide, groundwater flows in a generally westward direction (influenced by site pumping) within the abandoned channel.

Across the site, the average depth to the water table is 5 feet below the ground surface in the alluvial flats. The average depth to the water table in the uplands is 7 feet below the ground surface. The site alluvial aquifer is in hydraulic connection with the Little Blue River alluvium and the Missouri River alluvium. The principal concern is the potential for lateral off-site migration of hazardous wastes through the alluvial materials. Groundwater in the Pennsylvanian-age bedrock underlying the site is a minor component of the overall regional groundwater flow regime.

Public Drinking Water Advisory:

The Public Drinking Water Program has a record of 22 wells on site, of which 12 are used to supply drinking water to the facility. The number of contaminant sources around the plant and the number of conduits to

groundwater leave the drinking water supply at a very high risk of contamination.

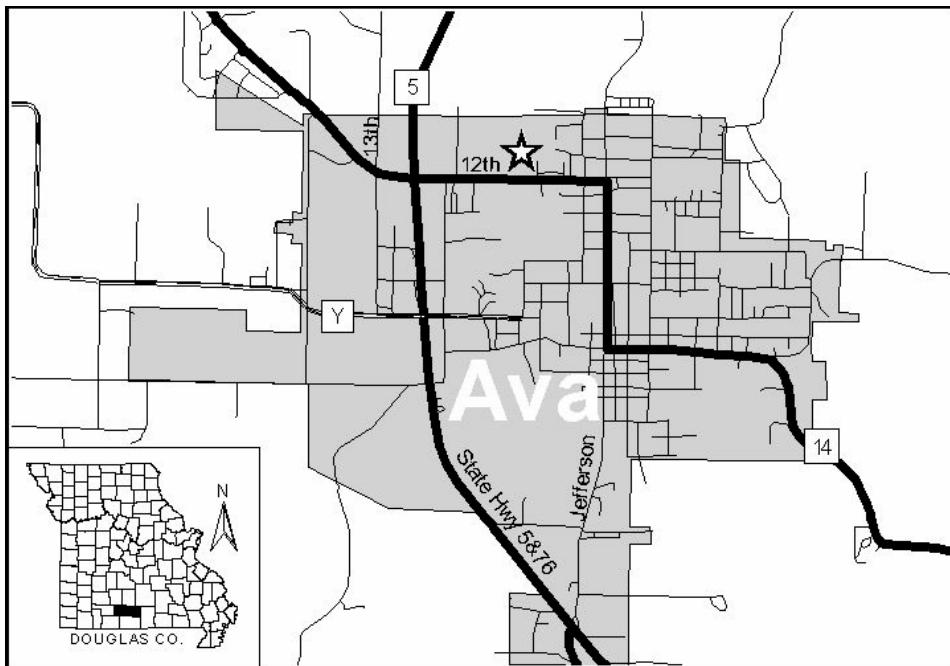
Health Assessment:

The following are the major contaminants of concern found in surface water, groundwater or soil at the site: antimony, arsenic, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, cadmium, 1,2-dichloroethene, 1,3-DNB, lead, tetrachloroethylene (PCE), toluene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethylene (TCE), vinyl chloride and 1,3,5-trinitro-1,3,5-triazine (RDX). Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

Due to the toxicity of the hazardous chemicals, surface soil, subsurface soil and groundwater contamination, a health risk exists at this site. Groundwater and private well monitoring to determine the extent of the off-site migration of hazardous wastes will enable health officials to determine potential human exposure.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Sentinel Wood Treating



Site Name: Sentinel Wood Treating

Classification: Class 1

Date of Placement: September 11, 1998

Address: 412 NW 12th Street, Ava, Douglas County, Missouri, Sec. 11, T. 26N, R. 16W Quadrangle

Present Property Owners: Sentinel Industries, Inc.

Lead Agency: DNR

Waste Type: Pentachlorophenol, arsenic and 2,3,7,8-TCDD (dioxin) equivalent

Quantity: Not determined

Site Description:

The Sentinel Wood Treating Site is a former wood treating facility that pressure-treated wood with pentachlorophenol (PCP) from 1959 to 1978. Sludge from the pressure-treating process was deposited in three lagoons on the property. These lagoons were closed between 1978 and 1979, when pressure-treating wood on site ceased. The lagoons were then backfilled with soil.

Part of the site is vacant; other portions are active commercial operations, including retail stores. The nearest residence is about 200 feet from the facility boundary.

Scrap lumber and sawdust from Copper Chromium Arsenate (CCA) lumber were reportedly burned in an unapproved and unpermitted incinerator on the site. One surface soil sample, collected in 1997, contained 62 parts per million (ppm) arsenic. Numerous dioxins and dibenzofurans were found on site.

On September 27, 1993, the U.S. Environmental Protection Agency (EPA) conducted a Site Inspection. Subsurface samples collected from the former disposal lagoon area exhibited extremely high concentrations of PCP. The analysis of these samples indicated that PCP was present up to 11,000 ppm in the former disposal lagoon area. The Missouri Department of Natural Resources' Cleanup Levels for Missouri (CALM) Soil Target Concentration Scenario A (residential) for PCP is 6 ppm. Other contaminants commonly found at wood treating sites (phenanthrene, total xylenes and 2-methylnaphthalene) were also detected in the lagoon samples. PCP was detected in shallow groundwater near the former lagoon

at 180 parts per billion (ppb). The EPA's drinking water standard, the Maximum Contaminant Level, is 1 ppb for PCP.

Environmental Problems and Areas of Concern Related to Site:

The groundwater has not been evaluated thoroughly. The department documented reports of PCP seeping from the surface of the lagoons. The site is situated in an area of karst terrain; therefore, contamination could potentially migrate off site. At this time however, no analytical data exists to indicate that off-site migration has occurred.

Remedial Actions at Site:

The EPA conducted a Removal Site Evaluation in August 1997. Sampling indicated the presence of several semi-volatile organic compounds (SVOCs), but PCP was the only SVOC identified above health-based screening levels in the lagoons. It was also detected at other areas of the property. Sampling results also showed dioxin equivalents at 23 ppb in the surface behind a retail store, and 10.3 ppb at the 4 to 6 feet interval in the lagoons.

The site was accepted into the department's Voluntary Cleanup Program (VCP) in October 1998. Further sampling and characterization of the portion of the property that does not include the lagoons was conducted in 1999.

A May 1999 report by Kingston Environmental indicated dioxin total equivalents of 23 ppb near the former wood treatment machinery. The VCP requested further investigation.

The city of Ava plans to construct a roadway along the east and north borders of the site. While the roadway will not be on Sentinel property, the construction easement, as well as grading for the roadway and installation of culverts, could disturb soil on the property. Areas of heavy contamination would be strictly avoided. The city has solicited the department's opinion on its proposed plans. The department responded with suggestions for sampling in several areas prior to construction to verify that disturbing soils will not spread contamination.

In July 2000, the EPA initiated a combined Brownfields Targeted Assessment and Removal Assessment investigation to conduct the suggested sampling. This assessment confirmed the presence of elevated levels of dioxin, PCP and PAHs in the soil and sludge from the lagoon area. In addition, the EPA's assessment revealed arsenic contamination in the northeastern portion of the site and low detections of dioxin and PCP in the perched groundwater, creek water and sediments.

The department is currently conducting an Expanded Site Inspection (ESI) investigation to better define the nature and extent of on- and off-site contamination. The ESI has already revealed new areas of contamination that were not previously known.

Sampling conducted as part of the ESI shows PCP and solvents in surface water downstream from the site. While the PCP may be attributable to the site, the solvents are likely not entirely attributable to Sentinel's wood treating operations. In addition, Ava's Municipal Wells, certain private wells, and a spring were sampled for contaminants of concern. Very low detections of PCP below the EPA's Maximum Contaminant Level were found in three wells. As a precautionary measure, all of Ava's four municipal wells are being monitored on a quarterly basis to ensure the safety of Ava's public drinking water supply. PCP was not detected in any of the municipal wells during quarterly monitoring in May, August and November 2001 and February 2002. The EPA plans to set up a schedule to sample for VOCs and SVOCs in the private wells.

Based on recent information, including preliminary ESI sampling results, the EPA has determined that a removal action is necessary to address the release of PCP from the Sentinel Site to the surface water and groundwater. An Administrative Order on Consent (AOC) to conduct a time-critical removal action was fully executed on September 17, 2001. This Order requires Sentinel to perform response actions that include activating the on-site groundwater diversion system. This system, installed in the late 1970s to divert and collect contaminated groundwater from the site, will pump the contaminated groundwater, treat it, and

discharge the treated water into the on-site stream. The contaminated groundwater may be the likely cause of the surface water contamination. In addition, the timing of future response actions at the site, including cleanup of the former lagoon and treatment areas, is partially dependent upon the successful operation of the diversion system to control potential off-site migration of contaminated groundwater. Also, Sentinel will be required to secure the site and conduct additional assessment activities to further characterize the wood treating contamination sources. Removal Action, Removal Assessment, and Quality Assurance Project Plan workplans were approved in February 2002. Work started around May 15, 2002.

The community organized a Community Advisory Group (CAG), and the first meeting took place in April 2002.

The EPA, the department, and the city of Ava signed an Agreement and Covenant Not To Sue regarding the proposed road and development of the property to the north of the site. The EPA and the department are wholly supportive of the city's economic redevelopment efforts, and believe that the city's expansion of the Ava Industrial Park can be conducted in accord with the overall cleanup effort.

General Geologic and Hydrologic Setting:

The site is located on an upland setting in the hilly Ozark Plateau physiographic province. Soils are composed of cherty, silty clay residuum developed from the underlying bedrock, the Ordovician-age Jefferson City Dolomite. Soil thickness is about 20 feet.

Wells in this area produce water from the Ozark Aquifer. The aquifer is composed of carbonates and sandstones. Five municipal wells have been drilled by the city of Ava within Section 11. The municipal wells are over 800 feet deep, extending into the Gunter Sandstone. Domestic wells in the area extend to depths ranging from 150 to 315 feet below the surface. Casing lengths extend from 4 to 294 feet. The Jefferson City Dolomite acts as a leaky confining unit. Contaminants migrating into the subsurface via vertical bedrock fractures or poorly-constructed wells

could move into domestic water sources, depending on groundwater flow direction and the nature of the contaminants.

Surface water flows off site to the south, where it enters Prairie Creek. Prairie Creek is a losing stream that flows westward. Contaminants that enter Prairie Creek as runoff may flow several miles to the west, reaching the water table along losing segments of Prairie Creek.

Public Drinking Water Advisory:

Sentinel Wood Treating is located within the wellhead protection area for four wells serving the city of Ava and one well serving the Fraternal Order of Eagles #3748. The wells serving Ava have been tested and show no sign of contamination. The wells will continue to be monitored as this site is considered a potential source of contamination.

Health Assessment:

PCP is a suspected carcinogen that can irritate the eyes, nose, throat and lungs. It can also irritate the skin and cause chloracne. It is acutely toxic; the lethal human oral dose is about one teaspoon. Arsenic is known to cause skin cancer in humans. Via ingestion, it may cause liver, kidney and bladder cancer. It may cause lung cancer by inhalation. In addition, chronic exposure can cause weight loss, nausea, diarrhea, hyperpigmentation, keratoses, hair loss, and peripheral neuritis.

Dioxin is one of the most toxic compounds known; however, its toxicity varies greatly among species. Animal studies have shown that dioxin produces acneogenic, fetotoxic, teratogenic, mutagenic, carcinogenic and immunogenic effects. In humans, it is known to have an acneogenic effect (chloracne). It is suspected to cause soft tissue sarcomas, Hodgkin's disease, non-Hodgkin's Lymphoma and porphyria cutanea tarda.

Based on available data, a serious health risk exists at this site. For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Thompson Chemical / Superior Solvents



Site Name: Thompson Chemical/Superior Solvents

Classification: Class 1

Date of Placement: September 23, 1986

Address: 60 Chouteau Avenue,
St. Louis, Missouri

Present Property Owners: Superior Solvent and Chemicals, a subsidiary of Superior Oil Company of Indianapolis, Indiana

Lead Agency: EPA

Waste Type: Polycyclic aromatic hydrocarbons (PAHs), volatile organic compounds (VOCs) and 2,3,7,8-TCDD (dioxin)

Quantity: Not determined

Site Description:

This site is located near the west bank of the Mississippi River in a historically industrial area of the city of St. Louis. Part of the site was used by Thompson Chemical Company, where it produced Agent Orange from approximately 1950 to 1968. A part of the property was used by Wood Treating

Chemicals Company, which formulated pentachlorophenol (PCP). Dioxin, a waste byproduct from the production of Agent Orange; a mixture of 2,4-D and 2,4,5-T; VOCs; and PAHs have been documented at the site. Superior Solvents currently operates an active solvent distribution business at the site. The site covers about three acres, is enclosed totally by a fence, and is secured with razor wire and a locked gate.

Environmental Problems and Areas of Concern Related to Site:

The site is fenced to prevent public access and exposure to contaminants. Off-site exposure of pedestrians and on- and off-site exposure of industrial workers to aboveground and underground contamination is possible. Also, Mississippi River flora and fauna could be exposed to contaminants due to the site's proximity to the river. The potential exists for surface water contamination due to runoff, and groundwater contamination due to incomplete paving.

Remedial Actions at Site:

In 1984, the U.S. Environmental Protection Agency (EPA) completed a Preliminary Assessment in June and a Site Investigation in October. Sampling verified the presence of

contaminants and a leaking underground storage tank (UST). Dioxin was found in the soils ranging from 1 part per billion (ppb) to 160 ppb.

In July 1986, excavation revealed dioxin soil contamination at 32.5 ppb. The excavation was filled, and the remaining soil was stored on site in roll-off boxes.

In February and August 1987, the EPA conducted additional sampling and found contamination seeps in the Mill Creek Trunkline Sewer. In December 1987, the EPA conducted a site removal. The UST with its contents and surrounding soils was excavated. The contaminated soils were stored on site in 12 roll-off boxes.

In November 1988, May 1989, and July 1989, sampling confirmed contamination seeps into the sewer and contaminated Mississippi River sediments adjacent to Mill Creek outfall. Metropolitan Sewer District (MSD) entered into a Consent Agreement with the Missouri Department of Natural Resources to remediate the sewer. In 1991, the Potentially Responsible Parties (PRPs) completed remediation of the Mill Creek Sewer with EPA and MSD oversight and approval.

In 1993, Superior Solvents blacktopped the dioxin-contaminated areas. The entire site was fenced and secured to limit access.

On April 4, 1996, the EPA issued an Administrative Order on Consent. In May 1996, an Engineering Evaluation/Cost Analysis (EE/CA) Workplan was submitted by the PRPs. On April 7, 1997, the EPA approved the EE/CA Workplan. The EE/CA report was submitted on April 15, 1998, and was found to be incomplete. Between August 1998 and 1999, a series of meetings were held regarding the EE/CA Report and additional work needed to complete the report.

Following the assignment of a new consultant for the PRPs, plans for a new EE/CA were approved in 2000. Field work for the EE/CA, which began in late 2000, was completed in late 2001. Currently, the draft EE/CA is being finalized.

General Geologic and Hydrologic Setting:

This site is about 300 feet west of the Mississippi River. This area is an alluvial remnant of the Mississippi River, altered by man-made fill material. Man-made levees to the east provide partial protection from floodwaters. Surface drainage and storm sewers flow to the east and enter the Mississippi River within 400 feet. Numerous sinkholes exist west of this site where the Mississippian-age bedrock lies close to the surface.

The subsurface soils consist of an upper zone of man-made fill and debris from the existing ground surface to a depth of 18 to 23 feet. The extremely heterogeneous fill is composed of dirt, cinders, brick, scrap concrete and other debris. Permeability in this unconsolidated zone is expected to be relatively high.

About 35 feet of alluvial clay, silt and sand underlie the fill material. The upper cyclic strata of silts and clays (10 to 15 feet thick) are underlain by fine- to medium-grained alluvial sand, with some gravel, cobbles and clay seams. The sand stratum, which varies in thickness from about 10 to 20 feet, appears to slope eastward toward the Mississippi River and is probably exposed in the river bed. Permeability of the sand varies considerably; consequently, a corresponding variation occurs in the rate of groundwater flow in the alluvium.

The St. Louis Limestone underlies the unconsolidated material on site at an approximate depth of 50 feet below the surface. Karst features have developed in this unit to the west of the alluvial area.

Most water movement is to the east, toward the Mississippi River via surface drainage or through permeable alluvium. The potential for infiltration into shallow alluvial groundwater supplies is high. The risk to bedrock groundwater supplies is reduced because the site is located in a discharge environment. However, groundwater supplies in the shallow bedrock could be affected by dense non-aqueous phase contaminants in high concentrations.

Public Drinking Water Advisory:

The area is served by St. Louis City Water Department, which uses the Missouri River and the Mississippi River as sources. The water intake on the Mississippi River is located upstream of the Thompson Chemical site. The site poses little threat to the public water supply.

Health Assessment:

Dioxin is one of the most toxic substances known; however, its toxicity varies greatly between species. Animal studies have shown that dioxin produces acnegenic, fetotoxic, teratogenic, mutagenic, carcinogenic and immunogenic effects. In humans, it is known to have an acnegenic effect (chloracne). It is also suspected to cause soft tissue sarcoma, non-Hodgkin's Lymphoma, Hodgkin's disease and porphyria cutanea tarda.

The site is fenced and secured to prevent public access, and the contaminated soil is

covered by asphalt. Some groundwater contamination could potentially extend from the vicinity of the site to the river; however, groundwater in this area is not known to be used for drinking purposes. Some contaminants possibly could reach the river, either through the groundwater or through the sewer system.

Based on available information, the site poses a health risk. While the site has been capped, the contaminated soil beneath the cap may still be mobile. The site has contaminated the adjacent sewer line. In addition, the roll-off boxes have been sitting on the site for more than a decade.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102 (573) 751-6404.

CLASS 2 SITES

ACME Battery



Site Name: ACME Battery

Classification: Class 2

Date of Placement: December 19, 1996

Address: 3340 Morganford Road, St. Louis, Missouri

Present Property Owners: St. Louis Development Corporation/Land Reutilization Authority

Lead Agency: DNR

Waste Type: Heavy metals (lead)

Quantity: Not determined

Site Description:

The ACME Battery Site was a former battery manufacturing plant that operated from 1963 until May 1997. The property is in a residential area interspersed with businesses and light industry. A September 1987 fire damaged much of the manufacturing and storage area and contaminated soils and debris with high levels of lead. The ACME Battery Company discontinued its operations in May 1997. The site is fenced and the remaining buildings are vacant.

Class 2 Sites

Environmental Problems and Areas of Concern Related to Site:

Concentrations of lead range from 400 to 37,500 parts per million (ppm). Leachable lead has been documented in soil in an uncapped area on site. Water and soil samples also exhibited a very low pH (highly acidic) condition. An ongoing threat of releases and migration of hazardous substances is posed by potential weather conditions at the site, particularly heavy precipitation events that may wash contaminated soil and sediments off site. Contamination from the ACME facility has apparently migrated to the neighboring facility operated by International Foods. During the dry summer months, contaminants could potentially be spread by wind.

Remedial Actions at Site:

During a 1988 Site Inspection, the U.S. Environmental Protection Agency (EPA) discovered high lead levels. In 1993, ACME entered into an Administrative Order on Consent (AOC) to address this lead contamination. In 1994, ACME capped a portion of the site, agreed to place a deed restriction on the capped area, and agreed to maintain the integrity of the cap. In May 1997, ACME discontinued operations at this facility.

In the fall of 1996, the Missouri Department of Natural Resources responded to a complaint that lead was migrating to an adjacent property owned by International Foods. The department conducted a sampling event in March 1997 that documented highly elevated lead levels and very low pH in both soil and water samples. In the fall of 1997, International Foods completed remediation efforts under the oversight of the department's Voluntary Cleanup Program to remove lead-contaminated and acidic soil from its facility. The data suggested that the lead and acid contamination were due to highly acidic, lead-contaminated materials migrating from the ACME Site. A railroad tie retaining wall was constructed, and limestone was applied in an attempt to prevent additional materials from washing off the ACME Site onto the International Foods property.

In December 1997, ACME petitioned the department director for a change in site classification. ACME submitted documentation that in October 1997, all of the storage and handling tanks were washed and prepared for sale, all transfer lines were purged and washed, and the below grade lines were then capped. ACME also reported that the source of the acid release had been removed. About 2,000 gallons of acid, remaining when operations were discontinued, was shipped to Big River Zinc in November 1997. The department director denied ACME's petition for a change of classification on the basis that the work was completed after the end of that fiscal year.

On June 15, 1998, the department's Hazardous Waste Program Enforcement Section issued ACME a Notice of Violation (NOV) for failure to determine if the waste observed in two on-site dumpsters was hazardous. The soil in these dumpsters had been stockpiled following a sewer repair project while the company was still operating. The soil was suspected of containing high levels of lead. ACME responded to the NOV on July 1, 1998. Its response contained analytical results for the two dumpsters of soil that indicated that the soil failed the Toxicity Characteristic Leaching Procedure (TCLP) for lead. The soil from the dumpster was then moved to roll-off containers. A Letter of Warning (LOW) and an NOV were issued on

July 22, 1998, for storage of hazardous waste for greater than 90 days, failure to keep hazardous waste containers closed, failure to mark containers with the words "Hazardous Waste", failure to package, mark, or label per Department of Transportation regulations during the entire on-site storage period, and failure to mark the date of accumulation on the container. The owner reported to the department that ACME is defunct and has no assets, and was therefore unable to perform appropriate response actions.

The discovery of a previously unknown, uncharacterized area on the south side of the property, between ACME and adjacent property owned by School Services, led the department to sample the soil in that area on August 5, 1998. Three of eight samples contained lead above health-based screening levels and failed TCLP. Results were as high as 18,100 ppm and 413 ppm TCLP for lead. The TCLP regulatory limit for lead is 5 ppm.

The state filed suit against ACME Battery in St. Louis City Circuit Court for violations of the Missouri Hazardous Waste Management Law.

The Hazardous Waste Management Law violation case against ACME was settled on August 14, 2000. The terms of the settlement included the responsible party's commitment to remove and properly dispose of the roll-off containers that contained characteristic hazardous waste. The roll-offs and their contents were removed by Envirotech for ACME in fall 2000. The department initiated a Site Reassessment (SR) to fully characterize the site and resolve outstanding concerns regarding the leachable lead in one area and migration of potentially acidic runoff from the site onto neighboring property; neither of which were addressed by the removal action conducted in 1994.

During the May 2000 Registry site inspection, the department learned that then-site owner ACME Battery, represented by Mr. Harvey Gershensen, had given a local environmental contractor, Envirotech, Incorporated, permission to use the formerly abandoned on-site building for office and warehouse space; however, the company had no formal occupancy agreement such as a lease.

After ACME Battery failed to pay property taxes, the property was offered for sale by the city of St. Louis at a tax auction in July 2000. No bids were received by the city, and ownership was subsequently transferred to the St. Louis Development Corporation/Land Reutilization Authority (LRA). Lead wipe samples were collected from the office and warehouse on August 2, 2000, to determine if the new building occupants were exposed to lead in building dust at levels of concern. The wipe sample collected from the office kitchenette floor contained lead at 64 times the screening levels for residential exposure, and levels in the warehouse ranged from 910 to 29,635 times the screening levels for residential exposure. The Missouri Department of Health and Senior Services (DHSS) subsequently recommended that the company vacate the building based on the health risk to workers posed by the high concentrations of lead in building dust. LRA evicted Envirotech in November 2000. After numerous appeals and extensions, Envirotech moved out on June 22, 2001.

The SR, completed October 31, 2001, confirmed findings of previous investigations. Elevated lead concentrations remain in soil, sediment, surface water, and interior building surfaces. No complete exposure pathways were identified during the SR investigation. The SR recommended no further action under CERCLA authority at this time, based on current conditions and the fact that no workers are present on site. The SR made the following recommendations.

- The cracks observed in the asphalt cap should be repaired immediately, regardless of planned reuse of the site.
- Lead-contaminated surface water and sediment should be removed from the low-lying area south of the former warehouse building for proper disposal. The area should then be brought up to grade or a drainage system installed to eliminate future ponding of water.
- Exposure to lead-contaminated surface soil north of the former manufacturing building should be controlled or eliminated. Preferably, the soil should be treated or removed for proper disposal.
- The 55-gallon drums of liquid materials inside and just west of the Quonset hut

should be characterized and removed from the site for proper disposal.

- Depending on how the site is redeveloped and re-used, lead contaminated soils beneath the asphalt cap may need to be treated and or removed.
- Should redevelopment of the site include re-use of existing buildings, comprehensive testing and lead abatement should be conducted on inside surfaces.

General Geologic and Hydrologic Setting:

The ACME Site is located on gently rolling uplands which consist of wind-blown loess, a soil that exhibits low to moderate permeability. A thin zone of residual clay soil, developed from the underlying bedrock, is present at 20 to 30 feet below grade. Bedrock, composed of undifferentiated Pennsylvanian-age shale, coal and sandstone, is present to a depth of about 60 feet below grade. Coal and clay were mined from the Pennsylvanian units. Thick sequences of Mississippian-age and older limestone formations are present at greater depths. Solution enlargement of bedding planes and joints is common in the limestone units.

Extensive grading of the area has produced a flat terrain, which tends to pond water, allowing infiltration through the surface soil. Infiltrated water could enter the artificially-created (mined) conduits within the uppermost bedrock, rapidly impacting the underlying aquifer.

Nearly all of the water used in the St. Louis area is obtained from surface water supplies, although some low-yield wells produce potable water from the Mississippian bedrock aquifer. Water produced from bedrock units underlying the Mississippian aquifer is mineralized and is not used.

Public Drinking Water Advisory:

The city of St. Louis is served by public drinking water from the Missouri, Mississippi and Meramec Rivers. No sources of public drinking water are expected to be affected by this site.

Health Assessment:

The primary health concern is human exposure from ingestion and inhalation. If the site were active, workers at the site could incidentally ingest unacceptable amounts of lead-contaminated dust and might also inhale this dust. In addition, evidence indicates that some of this contaminated soil has migrated off site and presents a health risk to workers at nearby facilities, including a nearby food-handling facility and a local park.

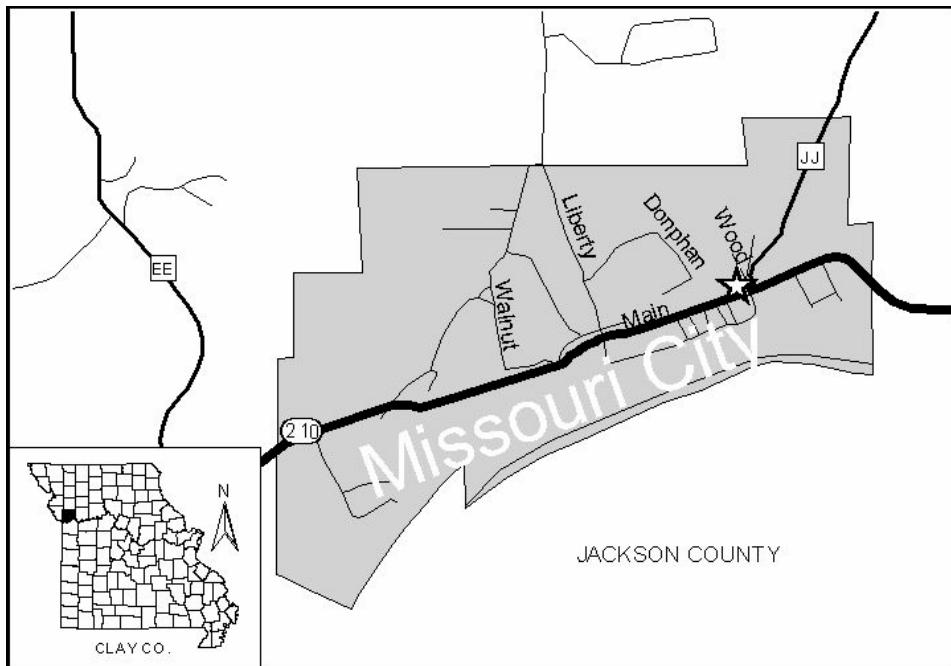
Lead attacks the kidneys, blood, gingival tissue, gastrointestinal tract and central nervous system. Prolonged exposure to elevated levels causes decreased IQs and

behavioral problems in children. Lead can also cause neuromuscular effects and high blood pressure in adults.

Based on available information, a substantial health risk exists on and around this site. Very high levels of leachable lead are present in surface soils at the site, and evidence indicates that this contamination has spread off site.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

BFI - Missouri City Landfill



Site Name: BFI - Missouri City Landfill

Classification: Class 2

Date of Placement: January 1, 1984

Address: Along Stillhouse Road, about one mile north of Missouri City, west of County Road JJ in Clay County, Missouri, SE 1/4, NE 1/4, NW 1/4, and SW 1/4, NW 1/4, NE 1/4, Sec. 8, T. 51N, R. 30W, Missouri City Quadrangle

Present Property Owner: Mr. Bill Woody, a.k.a. Talon Properties, Inc., and about seven acres owned by Browning Ferris Industries Waste Systems of North America, Inc. (BFI)

Lead Agency: DNR - Resource Conservation and Recovery Act (RCRA) post-closure and corrective action lead

Waste Type: Solvents, herbicide wastes, organophosphates, waste acids, waste oils, industrial wastewater treatment sludge, paint sludge, and heavy metals sludge

Quantity: Not determined

Site Description:

Located on a bluff above the Missouri River, the site consists of about 200 acres of which the southern 90 acres were used for waste management activities. The site was originally developed as a sanitary landfill. Additional industrial waste disposal trenches were constructed, filled and closed after Browning-Ferris Industries of Kansas City Inc. (BFI) leased the site in 1972 from Lincoln Brothers Land, Inc. BFI operated the facility from November 1972 until September 1983.

Waste management facilities included a sanitary landfill, a chemical processing center where bulk liquid wastes were received for temporary storage prior to treatment by fixation units, gelatin basins, seven bulk sludge disposal trenches, a chemical landfill, a wastewater treatment pond, a stormwater retention pond, and sludge drying beds. At least 160 million pounds of industrial wastes were deposited at the site.

The waste facility is adequately capped, vegetated and well-maintained. A fence and locked gate control access to the site. The site is located in rural Clay County. Several residences are within less than half a mile.

Environmental Problems and Areas of Concern Related to Site:

Groundwater contamination has been investigated and continues to be monitored and evaluated under a hazardous waste management permit issued by the Missouri Department of Natural Resources on December 19, 2000. Off-site groundwater contamination has been documented.

A ravine, which collects surface runoff and outcrop effluent, intermittently discharges into a stream that flows by a domestic dwelling, about 1,000 feet downgradient of the site. Sample results for 1996 and the first two quarters of 1997 indicate detections of pesticides in one surface sampling point. The ravine was dry during the first and second quarters of 2000. No pesticides were detected during the fourth quarter of 2001. BFI will continue to conduct surface sampling of this ravine downgradient of the site.

Remedial Actions at Site:

In September 1983, BFI-Missouri City discontinued operations. BFI developed a closure plan that was approved by the EPA and the department in December 1984. In the spring of 1985, BFI began implementing the closure plan. Closure certification was provided on November 27, 1987. During the closure process, a contaminated roadway and ravine were identified and characterized by BFI. BFI capped these areas in 1989.

BFI installed gas monitoring wells along the west and south perimeter of the facility. Prior to this installation, BFI analyzed the airspace of groundwater monitoring wells for combustible gas content. One groundwater monitoring well, located within 90 feet of a residence, contained significant amounts of combustible gas, primarily methane. Subsequently, BFI installed and is operating a gas recovery system around the west and south boundaries of the site. As a result, the level of combustible gas has fallen below detection levels in the well near this residence. The suspected source of methane is the sanitary landfill. The dense cap covering the landfill apparently prevented the gas from escaping. The success of BFI's methane gas collection and treatment system

significantly reduced the threat of methane gas to human health and the environment.

A small surface stream, flowing east-northeast from the drainage trench, past the chemical landfill, was sampled for sediment contamination in August 1986. The EPA evaluated results of this soil sampling, the quarterly water sampling of on-site and off-site monitoring wells, and surface streams. A leachate collection system and french drain are being used on site to prevent off-site runoff and migration. Leachate is collected weekly and transported off site for treatment.

Quarterly groundwater and surface water sampling in 1994 and 1995, indicated groundwater contamination was surfacing at outcrops along a ravine southeast of the fill areas and downgradient of the groundwater interceptor trench. In 1996, BFI added an interceptor trench and collection sump to collect leachate at the outcrop areas. They also installed an additional monitoring well to better determine the extent of contamination. In 1997, BFI addressed cap maintenance on the New Gelatin Basin and reshaped erosion letdown areas on the east side of the landfill.

BFI investigated releases to groundwater under an EPA Corrective Action Order. BFI conducted the RCRA Facility Investigation, the first phase of corrective action, and implemented Corrective Measures. A permit issued December 19, 2000, includes provisions for long-term monitoring and maintenance of the site.

Following failure by former owner Lincoln Brothers Land Inc. to pay property taxes on its portion of the site, the property was auctioned by the county in October 1998. Mr. Bill Woody, also known as Talon, Inc., Talon Properties, Inc. purchased the property.

General Geologic and Hydrologic Setting:

The soil, which averages 15 to 20 feet in thickness, is composed of moderately- to highly-permeable loess. Contaminants that leak into the permeable soil may eventually resurface downslope. Surface water flow in tributaries may subsequently transport the contaminants onto the Missouri River alluvium, recharging that important aquifer. In

fact, leakage has already affected shallow groundwater in the site's immediate vicinity.

The underlying bedrock consists of the Winterset Limestone and the Bethany Falls Limestone. A 5 to 7 foot sequence of shale is present between the limestone units. Several thin shale and limestone units are present beneath the Bethany Falls Limestone. Sandstone of the Pleasanton Group underlies these shales and limestones. All of the bedrock units, particularly the limestones, exhibit fracture permeability.

Public Drinking Water Advisory:

Missouri City purchases drinking water from surrounding water systems. Excelsior Springs has four active and one proposed well 3.8 miles east of the site. Tri-County Water Authority operates three wells 3.5 miles southeast of the site. Kansas City Water Services operates two wells at Atherton 3.5 miles southwest of the site. Liberty operates ten wells 6 miles southwest of the site. All of these wells are constructed in the shallow alluvial aquifer. None have been impacted by the site, but they demonstrate that the local groundwater is highly used as a source of public drinking water.

The predominant use of groundwater and surface water adjacent to the facility is for agriculture and livestock watering. Two shallow, hand-dug wells and a spring (Kinkade) have been identified in the immediate vicinity of the landfill. The hand-dug wells range in depth from about 8 to 10 feet and yield relatively small quantities of water (less than 2 to 3 gallons per minute). The Kinkade Spring is still used by at least one person.

Health Assessment:

Wastes deposited at the site included phenoxyacetic herbicide wastes, organophosphates, phenols, paint strippers, chrome sludges, waste acids and other hazardous materials. Many of these wastes have the potential to attack the central nervous system, kidneys, lungs, gingival tissue and skin. Some are known human and animal carcinogens and can cause teratogenic effects.

The primary route of exposure of concern is ingestion of contaminated water. A spring used as a drinking water source has been contaminated with several volatile organic compounds and pesticides. The cap and methane collection system help to prevent exposure from routes other than ingestion of water.

Health data for the residents within the city limits of Missouri City has been examined. Cancer deaths for years 1983 to 1993 for the study population were compared to statewide cancer deaths. Based upon age-specific cancer death rates, expected cancer deaths were calculated for the site. Using chi-square analysis, the observed number of deaths for total cancer overall was not significantly different from expected. No overall cancer rates were significantly different than expected, nor were any age-group cancer rates significantly different than expected.

Nativity data studied were low birth weight births (less than 2500 grams), gestational age less than 37 weeks, and fetal deaths for years 1990 to 1994. The observed low birth weight rate for the hazardous waste site was significantly different from expected, also based on the state rate. The observed number of fetal deaths was not significantly different when compared to the expected value. A second study of 1980 to 1989 births revealed an observed number of births with anomalies that was not significantly different from expected. This study was based upon aggregated birth and death certificates, hospital discharge, Special Health Care Needs, and neonatal intensive care unit data.

Based on available information, a health threat exists at this site due to the known contamination of the groundwater, the presence of known carcinogens, and the large volume of chemicals present. As long as off-site migration of waste is occurring, the potential for human exposure exists.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Conservation Chemical Company



Site Name: Conservation Chemical Company

Classification: Class 2

Date of Placement: January 9, 1984

Address: 8900 Front Street, Kansas City, Missouri, NW 1/4, Sec. 29, T. 50N, R. 32W, Jackson County, Liberty Quadrangle

Present Property Owner: Conservation Chemical Company

Lead Agency: EPA

Waste Type: Volatile organic compounds, solvents, acids, caustics, metal hydroxides, cyanide compounds, pesticides, waste oils, arsenic, and elemental phosphorus

Quantity: Estimated 93,000 cubic yards of material buried on site.

Site Description:

The Conservation Chemical Site, covering 6 acres, is located in an industrial area, about 1.75 miles east of Interstate 435 along Levee Road in Kansas City, Missouri.

Conservation Chemical began operating at the site in 1960. Industrial wastes were disposed at the site from 1962 to 1980. In 1975, the Missouri Department of Natural Resources investigated the operation and ordered it closed and cleaned up. The site was closed in 1979. Post-closure activities, which concluded in 1990, included capping six lagoons, grading, and vegetating the remaining portion of the site. The entire property was fenced to restrict access.

Environmental Problems and Areas of Concern Related to Site:

Site investigations conducted from 1979 through 1984 by the U.S. Environmental Protection Agency (EPA), and a Remedial Investigation conducted by the Potentially Responsible Parties (PRPs) in 1984 indicated that contaminants were migrating and contaminating the groundwater. Phenols, heavy metals, and volatile organics were the major contaminants detected in the groundwater.

The site is located in the flood plain at the confluence of the Missouri and Blue Rivers on the river side of the levee. The wastes at the site were stored primarily in unlined pits and were buried to a depth of at least 8 feet.

Groundwater depth under the site varies from about 5 to 13 feet, so that, in the wetter parts of the year, the groundwater comes into direct contact with the wastes. Because of the hazardous nature of some of the wastes, the lagoons were solidified with fly ash rather than dewatered and excavated.

Remedial Actions at Site:

The Focused Feasibility Study, completed in May 1985, evaluated remedial alternatives for the site. The EPA selected a Remedial Action that consisted of building a concrete wall around the site, with interior pumping and treating of the groundwater.

In 1986, additional investigations revealed that the depth to bedrock was about 160 feet, making the construction of the concrete wall more difficult. Also, in 1986, Superfund was amended and regulatory requirements changed. In light of these changes, the EPA reassessed potential remedies.

A Record of Decision (ROD) was signed in September 1987. The selected remedy consisted of: (1) surface cleanup, including demolition and disposal of existing buildings, tanks and debris; (2) installation of a two-layer protective surface cap over the existing fill, consisting of stable loess and topsoil; (3) installation of an extraction well system to achieve an inward groundwater gradient, to be measured by piezometer pairs along the perimeter of the site; (4) installation of a groundwater treatment system that includes sulfide precipitation; and (5) off-site groundwater quality and water level monitoring to assess changes in the groundwater quality around the site.

The Consent Decree was signed in April 1988. Remedial Action construction was performed in three phases. Phase I (completed August 1989) included: (1) surface cleanup and regrading of the site's surface; (2) placement of a two-layer protective surface cap; and (3) placement of rip-rap and installation of a 6-foot high metal perimeter fence. Phase II (completed April 1990) included installation of the following wells: (1) four pairs and redevelopment of two pairs of monitoring wells; (2) four pairs of piezometers; and (3) two on-site extraction

wells. Phase III (also completed April 1990) was the construction of an on-site groundwater treatment plant.

The Consent Decree requires annual meetings between the EPA, the department and PRPs to review the status of remedial activities. In addition, the Consent Decree specifies that PRPs shall submit the following reports: (1) State Operating Permit Reports; (2) Off-site Groundwater Monitoring Reports; (3) Metals Removal Reports; and (4) Groundwater Level Monitoring Reports.

Five-Year Reviews determine if the remedy selected is still protective of human health and the environment. At the end of 30 years, a complete reevaluation of the water monitoring program and a determination of the need for future monitoring will be done.

The startup of the groundwater extraction well system, monitoring well network, and groundwater treatment plant began in April 1990. The PRPs are required to operate the extraction system and groundwater treatment plant for at least 30 years.

Sampling and monitoring of the monitoring wells, extraction wells and piezometers must be done regularly. The groundwater extraction well system achieved the inward gradient requirements until August 2000. Multiple conditions including the Missouri River's low water flow led to problems maintaining the inward gradient.

The treatment process involves two metal precipitation processes: lime and sulfide. The sulfide system, which has been offline since March 1999, acted as a polishing step prior to discharge of the treated wasters to the Missouri River. The plant's effluent has met the state's operating permit criteria.

The surface cap must be inspected at regular intervals. Any erosion must be repaired immediately and vegetative cover added if needed. The grass must be mowed during the growing season. No excavation into the surface cap will be allowed without prior written approval. Wastes generated by the treatment plant must be disposed properly. An annual operating summary must be prepared at the end of each calendar year.

In June 1996, the PRPs presented a proposal to the EPA and the department to allow them to explore alternative approaches to remediate the site. Approval was given to explore alternative approaches while maintaining the current remedy. Based on the project's conclusions, an alternative remedial approach to the site's remedy was not proposed.

The EPA completed the "Combined First and Second Five-Year Review Reports" on February 29, 2000. The reviews determined that all response actions complied with the requirements of the ROD and Consent Decree. As a result, risks associated with direct contact to the on-site wastes have been eliminated. However, due to the remaining high contaminant concentrations at the plume's north area, and the possibility of high contaminant concentrations outside the influence of the groundwater extraction system, the remedy may not continue to provide effective protection of human health and the environment as required by the ROD. As a result, the EPA has asked the PRPs to reassess the health risks at the site.

General Geologic and Hydrologic Setting:

On-site soil is greater than 100 feet thick and is composed of alluvial sand, silt and clay. Typically, the grain size of these materials increases with depth. Bedrock is principally composed of interbedded shale and limestone, but is relatively unimportant in considering groundwater contamination potential because of its low permeability and great depth.

The alluvial aquifer is an excellent source of water. The elevation of the water table fluctuates, depending on the water level of the Missouri River. The direction of normal groundwater flow beneath the site is anticipated to be northeast toward the river. During flood stage, however, groundwater is recharged by the river.

The principal concern at this site is the potential for lateral migration of hazardous wastes off site. Subsurface migration of

contaminants through alluvial materials to the Missouri River is possible. In addition, the nature of some of the contaminants (i.e., dense, non-aqueous phase liquids) could allow for migration in directions other than that expected for normal groundwater flow.

Public Drinking Water Advisory:

The Independence Well Field is located in the Missouri River alluvium about 4 miles downstream. The nearest water system with an intake in the Missouri River is Lexington, 36 miles downstream. Any releases from the site would affect the water quality of the Missouri River, but would pose little threat to downstream public water systems due to dilution and natural purification.

Health Assessment:

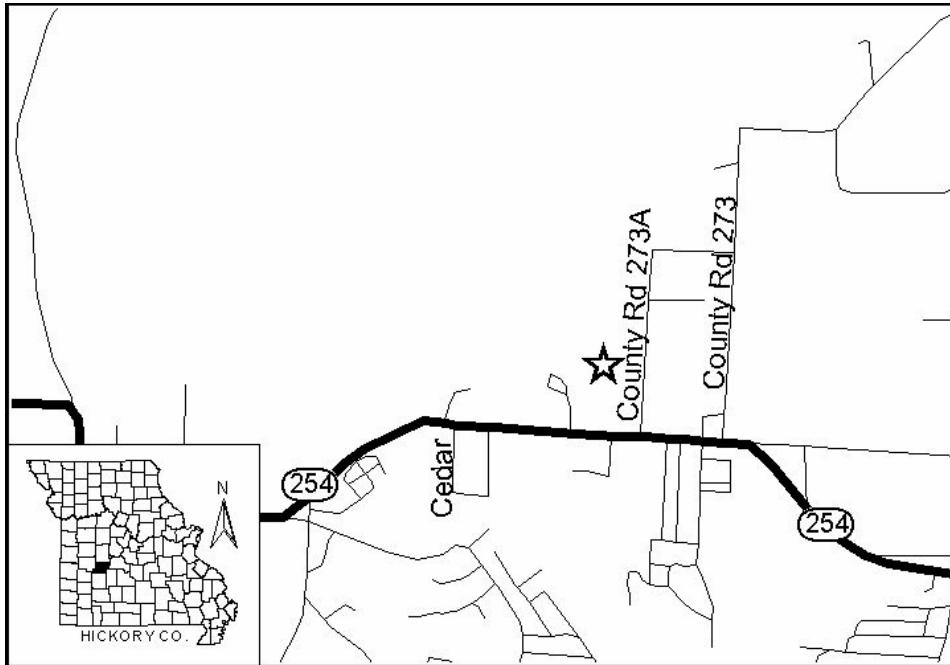
The following are the major contaminants of concern: benzene, cyanide, vinyl chloride, methylene chloride, 1,1,1-trichloroethane, trichloroethylene, 1,2-dichloroethane, chloroform, lindane, phenol, mercury, chromium, lead, arsenic, cadmium, and nickel. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

The closest public water supply is 4 miles downstream. Private drinking water wells are closer; however, they are shallow, alluvial wells located on the other side of the Missouri River. The closest use of groundwater is at Bayer Chemical-Agriculture Division Headquarters, which uses water from a well at its facility to dilute wastewater prior to release.

Although no direct evidence of human exposure exists from this site, the possibility exists because of its open and unguarded accessibility via the levee.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Electro Fab / Dorman Property



Site Name: Electro Fab/Dorman Property

Classification: Class 2

Date of Placement: August 17, 1987

Address: About 2.75 miles west of the Pomme De Terre Dam on Highway 254 at Galmey, Hickory County, Missouri, SE 1/4, SE 1/4, Sec. 5, T. 36N, R. 22W, Hermitage Quadrangle

Present Property Owners: Violet J. Dorman

Lead Agency: EPA

Waste Type: Trichloroethylene (TCE), chromium and lead

Quantity: Not determined

Site Description:

Electro Fab Inc., was a small metal fabrication company located on Missouri Highway 254, near the Galmey community in Hickory County. A portion of the manufacturing process involved the conversion coating of aluminum by the use of chromates and the subsequent rinsing of the parts. The rinse waters were then periodically discharged to

two surface impoundments, where hazardous sludge accumulated. The site is abandoned and unoccupied.

Environmental Problems and Areas of Concern Related to Site:

TCE was detected in the groundwater above the EPA's drinking water standard, the Maximum Contaminant Level (MCL), during one sampling event. Lead has been detected in a domestic well next to the site.

The site is located about 1.5 miles north/northwest of Pomme De Terre Lake. At least 20 households within 0.25 miles of the site are served by groundwater.

Missouri Department of Natural Resources' personnel conducted a site visit in June 1996 and noted a spigot on the west side of the road that runs north along the east side of the site. The spigot may be connected to the contaminated well on the Dorman property.

Remedial Actions at Site:

Shortly after the department discovered the site, the department's Environmental Services Program overpacked the six drums of listed hazardous waste (F019). They stored these

drums, along with the containers of chemical reagents, in Dorman's building. In November 1990, the department approved Electro Fab/Dorman's Resource Conservation and Recovery Act closure plan to clean up the two abandoned lagoons. In December 1990, the owners notified the department they did not have sufficient financial resources to implement closure and post-closure requirements.

Well samples collected annually by the Missouri Department of Health and Senior Services (DHSS) routinely contain TCE and chloromethane at concentrations below action levels.

Soil and sludge samples from the Dorman property contained up to 21,000 parts per million (ppm) chromium and lead at 280 ppm, which exceed health-based screening levels. Effluent in a septic tank on the Electro Fab property contained 180 parts per billion (ppb) TCE. A sludge sample taken from one of the ponds contained greater than 56 ppm TCE.

Using Superfund monies, the EPA conducted a time-critical removal action in October 1997. The EPA shipped 825 gallons of corrosive liquid waste off site for treatment and disposal. On-site lagoons were pumped dry and the water discharged to the soil surface around the lagoons. The EPA collapsed the lagoon dikes and graded the area flat to prevent future accumulation of water.

The EPA's contractor, Phillips Environmental, cleaned out the process septic tank, scraped the walls clean and collapsed them to prevent future re-use. The sludge removed from the tank was a characteristic hazardous waste. The contractor backfilled and graded the collapsed septic tank.

A number of drums of oily waste were removed from a drum storage area on the site. Spilled waste oil was collected with absorbents. The storage area was scraped clean, and one wall was collapsed to prevent re-use.

Philips Environmental shipped the waste off site for disposal. However, the EPA did not subsequently collect samples from the remediated areas to confirm cleanup.

The EPA removal action did not involve groundwater or any actions to prevent the use of the on-site well. This well is not part of the property listed on the Registry.

General Geologic and Hydrologic Setting:

Soils at this location are composed of gravelly clay residuum developed from Mississippian-age Burlington Limestone. Soil thickness is about 10 feet.

The Burlington Limestone, which is the uppermost bedrock unit at the site, is characterized by solution-enlarged fractures and significant permeability. However, the Burlington is underlain by the Northview Formation at a depth of only 20 to 40 feet below the lagoons. Regionally, the Northview Formation is considered to be a confining unit; under natural conditions, water and contaminants are not expected to pass through it to deeper groundwater. Therefore, constituents placed in the lagoons could potentially migrate downward to the Northview and then laterally either above or within the upper part of the Northview. In addition, surface and near-surface contaminants could migrate downward through the Northview Formation via fractures or poorly constructed wells.

Wells in this area produce water from the Ozark Aquifer, which is present at depths of greater than 50 feet at the site. This aquifer is composed of Ordovician-age carbonate and sandstone bedrock. Contamination of an on-site water well indicates that the Ozark Aquifer has been affected.

Public Drinking Water Advisory:

A new water supply, Hickory County Public Water Supply District #2, recently drilled two new wells. One of the new wells was drilled about one-quarter mile from the Electro Fab/Dorman Property. The well is cased to a depth of 375 feet. Routine monitoring by the department's Public Drinking Water Program showed no detections of volatile organic compounds (VOCs) in the well water. This water supply is not expected to be affected by the Electro Fab/Dorman Site and could provide a safe alternative to the less protected private wells in the area.

Health Assessment:

Some hexavalent chromium compounds are known human carcinogens, which attack the liver, kidneys, lungs, eyes, and skin. Lead attacks the kidneys, blood, gingival tissue, gastrointestinal tract, and central nervous system. Prolonged exposure to elevated levels of lead in dust or soil causes attention deficit disorders as well as physiological effects in developing systems in children under six years of age. Lead exposure in adults has subtle effects on several organ systems. TCE is a central nervous system depressant that is a known animal and suspected human carcinogen.

The potential routes of exposure for chemicals at the site include groundwater, surface water and direct contact. The site was previously overgrown with weeds and brush to the extent that direct contact was difficult. The site has since been cleared and leveled. The contaminants could be spread by surface water runoff during periods of rainfall. The other route of exposure of concern is contaminated groundwater. The concentrations of TCE (180 ppb) in the septic tank effluent and the pond sludge (>56 ppm) indicate that significant amounts of TCE have been released by the facility. Sampling has shown that TCE has migrated into the groundwater.

There are at least twenty households served by groundwater within a quarter-mile of the site. The level of lead in one well has

fluctuated between 8 and 18 ppb in recent years. This well is used by a family with small children. Because of the fluctuations in lead levels in water over the years, monitoring of the well will continue. Three people are now living in one of the former Electro-Fab buildings and using the Electro-Fab well as a water source. In addition, some property adjacent to the site was recently sold. The mobile home on this property has connected to the contaminated Electro-Fab well and is using it as a source of drinking water. Public water has recently been extended into the area around the site. Unfortunately, since area residents already have wells, they have been reluctant to hook up to public water, despite the presence of TCE and lead in the local groundwater.

Based on available information, a serious health threat exists at the site. TCE can migrate quickly from surface soils and often contaminates groundwater. The proximity of the private wells to the site is of serious concern. Of even greater concern is that the lead and TCE-contaminated well is being used by three families, one with small children. Groundwater contamination and direct access to the site constitute a health threat.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Farmland Industries



Site Name: Farmland Industries

Classification: Class 2

Date of Placement: March 30, 1988

Address: 4th and Seneca Streets,
St. Joseph, Missouri, NW 1/4, Sec. 17, T.57N,
R.35W, Buchanan County, St. Joseph North
Quadrangle

Present Property Owner: Burlington
Northern Railroad

Lead Agency: EPA

Waste Type: Pesticides, polycyclic aromatic
hydrocarbons (PAHs), heavy metals, and
volatile organic compounds (VOCs)

Quantity: Not determined

Site Description:

The Farmland Industries Site is contaminated with high concentrations of pesticides. This site is located in St. Joseph, Missouri, on the eastern bank of the Missouri River. This area of the Missouri River flood plain is moderately industrialized. Numerous manufacturing and

warehouse facilities are located adjacent to the property.

Between 1959 and 1980, several companies occupied the site while formulating organochlorine pesticides. The Woodbury Chemical Company first leased the property in 1959. Farmland Industries acquired stock in the company in 1966. By 1970, Farmland Industries and Dow Chemical each owned 50 percent of the company stock, and the company name was changed to Missouri Chemical Company. Farmland Industries purchased Dow's stock in 1974. In 1979, Farmland began liquidating assets and fully closed the pesticide formulation operation in 1980. The company removed all of the facilities and support structures and installed a cap. The site is capped with 18 inches of clean clay soil and vegetated. A 6-foot, chain-link security fence encompasses the entire site. Warning signs have also been posted.

Environmental Problems and Areas of Concern Related to Site:

Soil samples collected in 1985 showed concentrations of chlordane, heptachlor, aldrin and dieldrin. Some results were in the parts per thousand range. Samples from one area

contained greater than one percent chlordane. In addition to contaminated surface soils, subsurface soils and groundwater were contaminated. Aldrin was detected at 1,100 milligrams per kilogram at 15 to 16.5 feet in depth. Contaminants detected in the groundwater are consistent with those found in the subsurface soils. One water sample contained 11,000 parts per million (ppm) pesticides at 22 feet in depth. Although the contaminant plume is localized, the site is located in an area that has the potential to affect a major alluvial aquifer.

Remedial Actions at Site:

On November 2, 1989, the U.S. Environmental Protection Agency (EPA) entered into an Administrative Order on Consent (AOC) with Farmland Industries Inc., Missouri Pacific Railroad Company, and Burlington Northern Railroad Company to implement the proposed capping plan and to reimburse the EPA for oversight costs.

The capping plan was implemented in November and December 1989. All quadrants of the site that contained a total pesticide concentration of 50 parts per million (ppm) or greater were capped with 18 inches of clean clay soils. Contaminated areas immediately outside the existing fence that exceeded the capping standard were removed for placement under the cap. The soils were resampled to verify that the residual pesticide levels were below the 50 ppm action level. The facility fencing was maintained as the primary means of access control. Above-grade structures that hindered placement of the cap were removed. In April 1990, the site was prepared and seeded. A good vegetative cover has now been established on the cap.

Farmland continues to submit annual operation and maintenance reports to the EPA. These reports summarize all activities performed for the operation and maintenance of the cap during the preceding 12 months.

General Geologic and Hydrologic Setting:

Overburden at this location is composed of fill material over thick alluvial deposits, which are estimated to be 60 to 100 feet thick. The alluvium is composed of sand, silt and clay,

with the coarser-grained material predominant at depth. Clay-rich material is present beneath the eastern portion of the site.

The uppermost aquifer at this location is the Missouri River alluvium. Depth to groundwater, as indicated by monitoring wells, is in the range of 10 to 25 feet. The most likely direction for off-site migration of contaminants in groundwater is toward the Missouri River; however, the potential does exist for high-yield wells to alter flow direction in the alluvial aquifer.

Contaminants are not anticipated to affect groundwater in the bedrock, as the bedrock here typically displays low permeability.

Public Drinking Water Advisory:

The site is downstream from St. Joseph's former drinking water river intake and the new drinking water well field. No other sources of public drinking water are in this area, and none should be affected by this site.

Health Assessment:

The following are the major contaminants of concern: aldrin, chlordane, DDT/DDD/DDE, dieldrin, endrin, hexachlorobenzene, heptachlor, polycyclic aromatic hydrocarbons and beryllium. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

Potential routes of exposure include inhalation, direct contact, and ingestion of contaminated ground and surface water. Exposure may result through the inhalation of contaminated soil particles. The soil samples showing the highest pesticide concentrations were taken at 0 to 6 inches in depth. Although the site is fenced, laboratory data indicate significant levels of chlordane and heptachlor (400 to 700 ppm range) outside the fenced area. The most highly contaminated areas have been capped to reduce the potential for exposure and to reduce migration of wastes via groundwater. However, ground and surface water are potential routes of exposure. The site is located in the Missouri River alluvium and is within 200 feet of the river. This, combined with the concentration of

pesticides at 22 feet below the soil surface, is an indication that both surface and groundwater are probably contaminated. Finally, since the chlorinated insecticides at this site are fat soluble, they tend to accumulate in the food chain. Because of the extremely high levels of organochlorines and the proximity of the site to the Missouri River, human exposure is possible through the consumption of contaminated fish.

No recent exposures have been documented at this site. About a half-mile downstream is a small group of homes that are located very near the river.

Based on available information, a health threat exists at this site. It is located away

from residential areas; however, the extremely high concentrations of organochlorines, because of their persistence and their tendency to bioaccumulate, create a public health threat. Although the site has been capped, uncapped areas with significant concentrations of organochlorines not only exist, but are outside the fence and accessible to the general public.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Fulbright Landfill



Site Name: Fulbright Landfill

Classification: Class 2

Date of Placement: January 15, 1984

Address: Highway 13, north of the Springfield, Greene County, city limits. Adjacent to an inactive northwest sewage treatment plant on Bolivar Road SE 1/4, Sec. 35, SW 1/4, SW 1/4, Sec. 36, T. 30N, R. 22W, and NE 1/4, NE 1/4, NE 1/4, Sec. 3, T. 29N, R. 22W, Ebenezer Quadrangle

Present Property Owner: City of Springfield

Lead Agency: EPA

Waste Type: Cyanide, acids, plating residues (cadmium and chromium), heavy metals, trichloroethylene (TCE), paint, waste oil, and pesticide (pyrethrum) residues

Quantity: Not determined

Site Description:

Fulbright Landfill is located in the South Dry Sac River flood plain, just north of Springfield. The city of Springfield operated the landfill from 1962 to 1968 to dispose of municipal and

local industrial waste. In 1967, one person died from cyanide poisoning while unloading incompatible wastes at the landfill sludge pit. Another person was nearly overcome by fumes while covering the sludge pit.

The landfill is located east of Highway 13 and next to the Sac River Landfill. The U.S. Environmental Protection Agency (EPA) has addressed monitoring of both landfills as a single site.

Environmental Problems and Areas of Concern Related to Site:

The Fulbright Landfill is located on the flood plain of a tributary to the Little Sac River. The Little Sac River is a tributary of Stockton Lake, a major recreational and fishing resource. The site is located near, but downgradient from, Fulbright Spring, a large spring that is a source of drinking water to the city of Springfield. Residences within 1,000 feet of the site use groundwater as a source of drinking water. A Springfield city police shooting range is located near the landfill.

The potential for contaminant migration into the Ozark Aquifer at Fulbright Well No. 1 is currently being studied.

Remedial Actions at Site:

On March 13, 1986, the EPA issued a Consent Order under Section 106 of the Comprehensive Environmental Response, Compensation and Liability Act to the city of Springfield and other Potentially Responsible Parties (PRPs). The Consent Order required the PRPs to conduct a Remedial Investigation/Feasibility Study (RI/FS) for both the Fulbright Landfill and the adjacent Sac River Landfill under the oversight of the EPA. Both were municipally-operated solid and industrial waste landfills. The RI/FS has been conducted in stages, each stage building upon data and knowledge about the site established from the previous stage.

The Geophysical Investigation Report was released in June 1986 and used for final revisions in the design of the groundwater monitoring network of the RI.

A Quality Assurance Project Plan (QAPP) was submitted by the PRPs for the monitoring well installation and environmental monitoring. The QAPP was approved by the EPA, and the PRPs began installation of the monitoring wells in July 1986. Sample collection and analysis by the PRPs was completed in May 1987. Two rounds of environmental (soil, groundwater, surface water and surface water sediment) samples were collected for chemical analyses in the RI. A series of 22 monitoring wells were installed during the RI in both the alluvium and shallow bedrock.

In September 1987, the PRPs submitted the draft Remedial Investigation/Endangerment Assessment (RI/EA) report to the EPA for review and approval. In April 1988, the EPA completed its review and released the RI/EA report for public comment. The FS for the site was completed and approved by the EPA and the Missouri Department of Natural Resources.

Based on findings of groundwater monitoring and other investigations in the RI, the EPA signed a Record of Decision (ROD) selecting remedial actions for the Fulbright Landfill and the Sac River Landfill in September 1988. Remedial actions for the site consist of the following:

1. Drummed wastes in a sinkhole above the Fulbright Landfill were excavated, tested, treated or disposed of as appropriate. The area was then capped and vegetated.
2. Deed restrictions were placed on the property, controlling future uses.
3. Ground and surface water samples from the site are being collected and analyzed on a regular basis as part of a long-term monitoring plan.
4. A contingency plan has been developed for leachate control in the event that leachate is noted to be a significant or continuing problem.

The EPA and the PRPs for the site negotiated a Consent Decree for the performance of the above remedial actions. The Consent Decree became effective in February 1990. The drum removal at the Fulbright sinkhole was completed in the fall of 1990. Sampling of soils in the sinkhole indicated no significant residual contamination. The sinkhole was backfilled and reseeded.

In early 1993, an RI was conducted at the adjacent North U Drive Site. During the North U Drive RI, the groundwater levels in the deep aquifer were noted to fluctuate dramatically over short periods of time, corresponding to variations in pumping rates at the nearby Fulbright pumping station. This localized, but dramatic, effect on the deep aquifer caused the department to suspect that groundwater beneath the Fulbright Landfill may also be affected by pumping at the Fulbright pump station, which pumps as much as 3,000,000 gallons per day. Of particular concern is the potential that groundwater no longer flows away (northwest) from the Fulbright pump station, but now may flow toward the Fulbright pump station.

At the department's Hazardous Waste Program's request, the Geological Survey and Resource Assessment Division (GSRAD) investigated groundwater beneath the Fulbright Landfill to evaluate this potential problem. The study was funded by the EPA. The GSRAD completed a final hydrogeologic investigation report of the Fulbright area in fiscal 1995. The report concluded that the

possibility exists for contamination from the shallow aquifer to reach the deeper aquifer and Fulbright Well No. 1, a part of the city of Springfield's public water supply. The GSRAD report recommended installation of a shallow monitoring well and the use of a deep well, Fulbright Well No. 2, as an early warning system to indicate contaminant migration toward Fulbright Well No. 1.

Shallow groundwater data indicates that most volatile organic compound concentrations are decreasing. However, in one well, TCE concentrations increased to 1,100 parts per billion (ppb) in 1995, but have shown a downward trend since that time. Sampling conducted in April 2000 detected concentrations at 311 ppb TCE, 226 ppb vinyl chloride, 216 ppb 1,2-dichloroethane (1,2-DCA) and 216 ppb chromium.

The city of Springfield voluntarily remediated the leachate seep and exposed trash to ensure that the public water supply is not impacted. The city excavated the exposed trash along the bank and stabilized the area. Large volumes of leachate were not encountered during this action. A monitoring well was installed that will detect the potential for contamination of the deeper aquifer from shallow, contaminated zones. Early indications are that Fulbright Well No. 1 is not in danger of being contaminated. However, further measurements are needed to confirm this conclusion.

From 1998 to 2000, the city conducted water level and chemical monitoring at the new well. Results indicated that the shallow aquifer was not contaminated. Water level measurements conducted during startup pumping of the city's production well were inconclusive with respect to the connection of the shallow aquifer to the deep, Ozark aquifer. The city conducted a second pump test on Fulbright Well No. 1, similar to the pump test conducted the previous year, and the water level in the upper aquifer went up. This is a very unusual hydrogeologic phenomenon, but one that has been documented in other locations and at this site during 1997. Unlike the 1997 pump test, during the 1998 pump test, water levels in the upper aquifer decreased through time while pumping the lower aquifer. This may indicate a connection

between the two aquifers. However, interpretation of these results remains unclear. In 2002, the pump test was repeated prior to shutdown of Fulbright Well No. 1 in order to conclusively ascertain a hydraulic connection between the upper contaminated aquifer and the lower aquifer as influenced by Fulbright Well No. 1. The report for this work has not yet been submitted.

General Geologic and Hydrologic Setting:

The site is located on the flood plain of the South Dry Sac Creek. The creek is gaining or begins to gain near the landfill. Soils consist of permeable alluvium. Bedrock is composed of Burlington Limestone.

If hazardous materials were deposited in this area, it is likely the leachate developed from these materials is migrating with the shallow groundwater into the river. Because of the relatively rapid interchange between water within the alluvial gravels and surface flow in the stream channel, the water quality of the stream could be considerably affected. It is not anticipated that a significant amount of leachate has entered the bedrock groundwater system.

Public Drinking Water Advisory:

Fulbright Spring, one source of Springfield's water supply, is about 2,000 feet uphill and upgradient from the site. A deep public drinking water well adjacent to Fulbright Spring is currently pumping up to 3,000,000 gallons per day. Many private wells are within 0.5 miles of the site. Although no releases have been observed, the site is of concern and is a potential threat to nearby water systems, due to the hydrogeologic conditions of the Springfield area.

Health Assessment:

The following are the major contaminants of concern detected in the Fulbright Landfill monitoring well system: barium, chromium, cyanide, 1,2-dichloroethylene, trans-1,2-dichloroethylene, lead, manganese, nickel, trichloroethylene, and vinyl chloride. Please refer to the Health Assessment Chemical Table in Appendix A for a

description of the potential adverse health effects associated with these contaminants.

Routes of exposure associated with the site include the possibility of ingestion of contaminated groundwater, direct body contact with surface water downstream of the site, and inhalation of volatilized chemicals. The ingestion route is the main concern since the site has the potential to affect groundwater.

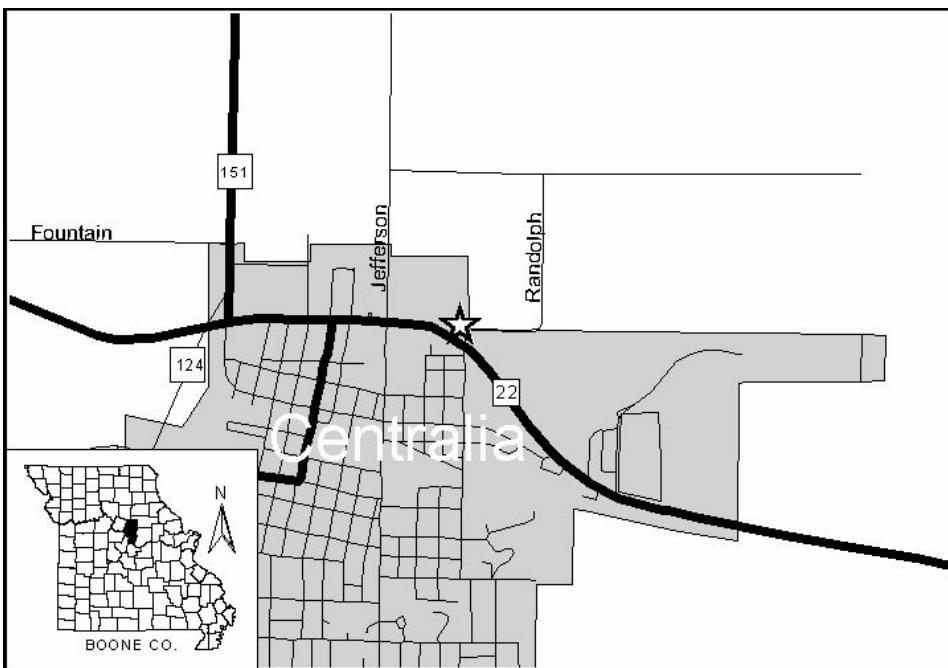
The Missouri Department of Health and Senior Services (DHSS) last collected water samples from private wells around the Fulbright Landfill in June 2002. None of the wells showed contamination by volatile organic compounds above the EPA's drinking

water standard, the Maximum Contaminant Level. These wells will continue to be monitored by the DHSS.

Human exposure to surface water downgradient from the site is unknown. Based upon available information, there is potential for contamination of the groundwater and future human exposure to the wastes from the landfill; therefore, a health risk exists at this site.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Green Acres Farm Supply



Site Name: Green Acres Farm Supply

Classification: Class 2

Date of Placement: December 7, 1990

Address: North side of Highway 22, approximately 0.75 miles west of east city limit boundary, Centralia, Boone County, Missouri, SE 1/4, SW 1/4, NE 1/4, Sec. 10, T. 51N, R. 11W, Centralia Quadrangle

Present Property Owner: Industrial Control Services

Lead Agency: DNR

Waste Type: Herbicides and pesticides

Quantity: Not determined

Site Description:

Green Acres Farm Supply was formerly an agricultural chemical retailer. The site is located within the city limits of Centralia. The area is primarily an agriculture community, with both row crops and cattle production. Prior to 1980, the company washed equipment behind the facility. The wash waters and any leftover herbicide and

pesticide solutions drained into an on-site lagoon. The lagoon was filled sometime around 1981.

A citizen complaint led to an inspection of Green Acres by Missouri Department of Natural Resources personnel in 1985. At that time, personnel noted that the area of the former lagoon failed to support vegetation. Also observed was a strip of bare soil leading from the lagoon toward an intermittent stream. The department initiated a Site Inspection (SI) of the former lagoon and lagoon drainage sediment in 1986. The SI concluded the soil in these areas was contaminated with herbicides and pesticides.

Industrial Control Services purchased the site on March 15, 2000, and began operating a manufacturing business in the on-site building.

Environmental Problems and Areas of Concern Related to Site:

The principal environmental concerns are the migration of contaminants off site through surface sediment runoff and vegetative damage caused by herbicides. The former lagoon area is devoid of vegetation. Potential for shallow groundwater contamination is also a concern.

Remedial Actions at Site:

To date, no remedial actions have been implemented. In May 1998, Green Acres signed a Letter of Agreement with the department's Voluntary Cleanup Program (VCP) for state oversight of site characterization and remediation. Green Acres withdrew from VCP on March 9, 2000, prior to developing a Remedial Action Plan.

The owners placed concrete pieces in on-site gullies in an attempt to control soil erosion.

General Geologic and Hydrologic Setting:

The Green Acres Farm Supply Site is located in the uplands on a nearly flat, glaciated plain. The soil at the site consists of 50 to 60 feet of glacial drift, covered by 3 to 5 feet of weathered loess. Sand and gravel lenses may be present within the drift, but coarse-grained deposits are not continuous over a wide area. The surficial materials are characterized by low permeability.

Geologic mapping indicates that the uppermost bedrock at the site consists of Pennsylvanian-age shales, sandstone and limestone stringers. The shaly bedrock and low-permeability surficial materials form an aquitard that should prevent vertical migration of contaminants from the site.

Mississippian-age carbonates compose the uppermost aquifer for domestic water use in the area. This Mississippian aquifer is not expected to be affected significantly by contaminants from the site.

The principal concern is the off-site migration of contaminants through surface water runoff. Runoff is transported down a nearby roadside drainage ditch.

Public Drinking Water Advisory:

The city of Centralia is served by three deep wells located 0.5 to 1 mile from the site. Boone County Public Water Supply District No. 10 is located 1.75 miles west of the site. All nearby wells are about 1,400 feet deep, with a minimum of 460 feet of casing, and

draw water from the Ordovician-age Gasconade Formation. According to the department's Geological Survey and Resource Assessment Division (GSRAD), the bedrock aquifers in the area (and, therefore, the city wells) would not be expected to be significantly impacted by potential releases from the site.

Health Assessment:

The following are the major contaminants of concern: alachlor (Lasso), aldrin, atrazine, endosulfan, heptachlor, heptachlor epoxide, beta-hexachlor cyclohexane, delta-hexachlorocyclohexane, Lindane (gamma-hexachlorocyclohexane) and trifluralin (Treflan). Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

Ingestion of contaminated water and aquatic organisms are the primary routes of exposure of concern. Humans could be exposed to bioaccumulative pesticides through contaminated surface water. Groundwater contamination is also possible. According to the GSRAD, the public water supply is not threatened. However, a few private wells exist in the area. GSRAD concluded that the aquifer closest to the surface, 200 to 250 feet in depth, may be at risk. Three shallow private wells near the facility are sampled annually by the Missouri Department of Health and Senior Services. None have had detectable levels of herbicides.

Based on available information, a health risk exists at this site. This determination is based on the obvious surface soil contamination (the lagoon area is still devoid of vegetation), the potential for groundwater contamination, the persistence of the pesticides involved, and their tendency to bioaccumulate.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

HCI Chemtech - Birmingham Road



Site Name: HCI Chemtech-Birmingham Road

Classification: Class 2

Date of Placement: March 5, 1999

Address: 6301 Northeast Birmingham Rd., North Kansas City, Clay County, Missouri, W ½, SE ¼, SW ¼, Sec. 9, T.50N, R.33W, North Kansas City Quadrangle

Present Property Owner: Brenntag, Inc.

Lead Agency: DNR and EPA

Waste Type: Volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), herbicides

Quantity: Not determined

Site Description:

The HCI Chemtech - Birmingham Road Site is a bulk chemical storage and distribution facility that has been in operation since 1968. The facility encompasses 11 acres situated along the northern bank of the Missouri River. Residences are located about 1,000 feet north of the site. The site is fenced with a security restrictive gate. On-site structures include an

office, warehouse, maintenance buildings, boiler heating facilities, laboratory, and tank farms that contain 22 active aboveground storage tanks (ASTs). Current storage and handling activities are restricted to caustics and asphalt, due to the transfer of some operations to the HCI Chemtech - Stillwell Street facility.

During previous site operations, as many as 66 ASTs have been used at the site. Forty-six of those tanks were located in containment areas with earthen floors until 1995, when the floors were paved with concrete. The tanks were grouped in eight tank farm areas.

Bulk chemicals were delivered to the facility by trucks, barges and rail car, and stored in ASTs. Chemicals have been mixed or repackaged prior to sale or sold in bulk. The truck fleet distributed the chemicals, with chemicals shipped primarily via tank truck or drums.

Spills are the probable source of on-site contamination of soils and groundwater with VOCs, SVOCs and herbicides. The HCI Chemtech - Birmingham Road facility has a history of spills and releases of hazardous materials that dates back to the 1970's. The most serious of these releases occurred on

September 10, 1995, when at least 13,000 pounds of rayon grade sodium hydroxide was released on site. The company diluted this material with water and released effluent with a pH of 12.8 into the Missouri River.

Environmental Problems and Areas of Concern Related to Site:

VOCs have been detected at concentrations above health-based screening levels in soil and groundwater. The pH of shallow groundwater has been documented at values ranging from 6.85 to 11.9. The site is located in a 20-year flood plain. A significant potential exists for site-related contaminants to be released to the Missouri River during a flood event. Erosion and dissolution of waste during flood conditions could allow for direct transport of contamination or could result in the generation of leachate. Significant releases of contaminants from the facility are known to have entered the Missouri River in both 1994 and 1995. Groundwater to surface water discharge is also likely. Groundwater generates seepage along the river bluff, and this seepage discharges into the Missouri River.

In 1992, three employees were killed by an explosion at the site. The workers were welding near a tank emitting anhydrous ethanol vapors.

The 2002 annual Registry inspection noted that an area of ground in the southwest corner of the site is slumping off into the drainage area of the Missouri River. The area of slumping is about 15 feet long and has receded about 15 feet from the property fence line. The site owner is working with the city to stabilize the area.

Remedial Actions at Site:

A Notice of Violation was issued to HCI Chemtech after an inspection by the Missouri Department of Natural Resources on December 10, 1993. Citations included failure to have secondary containment and maintaining a satellite area of unlabelled drums near the hazardous waste storage tank. A joint hazardous waste and air pollution compliance evaluation was conducted by the department on August 2,

1995. The company was cited for 17 violations of the Missouri Hazardous Waste Management Law. The violations indicated that the company was not properly handling hazardous waste nor maintaining adequate secondary containment for hazardous materials.

Following a release of sodium hydroxide from the site in September 1995, HCI Chemtech was indicted for criminal violations of the Clean Water Act and of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). HCI Chemtech pled guilty and was placed on probation. As a special condition of this probation, HCI Chemtech was required to adopt corporate and compliance monitoring programs for each of its facilities in Missouri, including the HCI Chemtech-Birmingham Road Site. A Compliance Agreement, entered into by HCI Chemtech, the United States Attorney's Office, the U.S. Environmental Protection Agency (EPA), and the department, effective November 7, 1997, specifies that HCI Chemtech shall investigate and characterize its sites.

The department completed a CERCLA Preliminary Assessment (PA), in March 1998. HCI Chemtech submitted a Remedial Investigation work plan to the EPA and the department for the Birmingham Road facility, outlining additional investigation as part of the compliance agreement. The investigation was designed to help determine the horizontal and vertical extent of contamination in both the soils and the groundwater at the site. The consultants for HCI Chemtech began work the week of May 8, 2000, and returned the week of June 5, 2000, to conduct additional sampling. HCI Chemtech will conduct quarterly groundwater monitoring for two years. When the monitoring is complete, HCI Chemtech will then develop a risk assessment for the site.

In the fall of 2000, Brenntag, Inc., purchased HCI Chemtech. The Compliance Agreement expired in fall 2000 when HCI Chemtech's probation ended. Additional subsurface sampling was conducted in September 2000 to better delineate the extent of the groundwater plume. During the May-June 2001 soil sampling event, samples were

analyzed for VOCs, SVOCs and pesticides. The highest concentration measured for any of the analytes was 2,400 parts per billion of toluene in a sample collected by the northeast side of the former solvent tank farm. Quarterly monitoring of groundwater continues.

Brenntag submitted a draft work plan to the EPA for additional investigations. The EPA plans to begin negotiations on an Administrative Order on Consent (AOC) with Brenntag to ensure continued investigation leading to a site cleanup.

General Geologic and Hydrologic Setting:

The HCI Chemtech-Birmingham Road Site is located within the 20-year flood plain just to the north of the Missouri River. The topography is generally level.

The site is underlain by about 120 feet of moderately- to highly-permeable alluvium, composed of interbedded sand, gravel and clay. The alluvium is, in turn, underlain by the Pennsylvanian-age Kansas City Group, which is made up of interbedded shales and limestones with low to moderate permeability.

The alluvial aquifer is recharged through surface water infiltration, as well as through discharge from surrounding bedrock. In general, the groundwater within the alluvium beneath the site flows toward the Missouri River. Hydraulic gradient and actual groundwater flow direction are dependent upon fluctuating river level.

Site-related contaminants could potentially discharge to the Missouri River.

Public Drinking Water Advisory:

The nearest public drinking water wells are 6.8 miles downstream of the Birmingham

Road facility in Courtney Bottoms along the Missouri River. The nearest surface water intake downstream of the Birmingham Road facility is over 40 miles away. No drinking water sources are immediately impacted by the site. However, the type and amount of chemicals at the Birmingham Road facility do threaten the potentially usable groundwater.

Health Assessment:

Soil and groundwater are contaminated with the following solvents: tetrachloroethylene, trichloroethylene, 1,2-dichlorobenzene, benzene, toluene, ethyl benzene and xylene.

Benzene, toluene, ethyl benzene and xylene are volatile organic compounds commonly associated with gasoline. The most toxic of the four is benzene. A known human carcinogen, benzene has been shown to cause leukemia and aplastic anemia in children. Ethyl benzene can cause kidney and liver damage. All four compounds can cause dermatitis and central nervous system depression, which is characterized by dizziness, headache, loss of coordination, and narcosis. Chlorinated solvents such as tetrachloroethylene and trichloroethylene are considered hazardous because they are mutagenic, carcinogenic and teratogenic.

Four private drinking water supply wells were identified within a 4-mile radius of this site.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

HCI Chemtech-St. Louis



Site Name: HCI Chemtech-St. Louis

Classification: Class 2

Date of Placement: December 28, 1998

Address: 139 E. Soper St., St. Louis, Missouri, NW ¼, NW ¼, NW ¼, Sec. 16, T.44N, R.7E, Cahokia Ill.-Mo.Quadrangle

Present Property Owner: Brenntag, Inc.

Lead Agency: DNR and EPA

Waste Type: Volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), and metals

Quantity: Not determined

Site Description:

An active chemical formulation and distribution facility has operated at the site since 1967. The site encompasses 15 acres in an industrial area. Residences are located about 1,000 feet from the site. On-site structures include an office, warehouse and tank farms that contain 76 aboveground storage tanks (ASTs). As many as 92 ASTs have been used during past operations.

Those tanks were located in containment areas with earthen floors until 1992, when most of the storage areas were paved with concrete.

Bulk chemicals are delivered to the facility by trucks, barges and rail cars, and are stored in ASTs. Chemicals may be mixed, repackaged prior to sale, or sold in bulk. Wastewater generated from drum rinsing is neutralized and discharged to the sewer system under a permit from the local sewer district.

The HCI Chemtech-St. Louis Site has a history of spills and releases of hazardous materials that dates back to the 1980's. Spills and drum rinsing are the probable sources of on-site contamination of soils and groundwater with VOCs, SVOCs and metals.

Environmental Problems and Areas of Concern Related to Site:

VOCs, SVOCs and arsenic were detected at concentrations above health-based screening levels in groundwater. VOCs and arsenic were detected at concentrations above health-based screening levels in soil. Soil pH values range from 4.5 to 11.2. Hazardous substances from the site could be released to the Mississippi River during a flood event.

Remedial Actions at Site:

Following a release of sodium hydroxide in September of 1995 at its Birmingham Road facility, the owner, HCI Chemtech, was indicted for criminal violations of the Clean Water Act and of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). HCI Chemtech pled guilty and was placed on probation. As a special condition of the probation, HCI Chemtech was required to adopt corporate and compliance monitoring programs for each of its facilities in Missouri, including the HCI Chemtech-St. Louis Site. A Compliance Agreement, entered into by HCI Chemtech, the United States Attorney's Office, the U.S. Environmental Protection Agency (EPA), and the Missouri Department of Natural Resources, effective November 7, 1998, specifies that HCI Chemtech shall investigate and characterize its sites.

During fiscal 1999, the EPA and the department reviewed and commented on plans and reports submitted by HCI Chemtech pursuant to the Compliance Agreement. During fiscal 2000, the EPA and the department approved the Remedial Investigation work plan. Additional monitoring wells were installed. Several rounds of groundwater sampling and hydrogeologic investigations were conducted.

In the fall of 2000, Brenntag Inc., purchased HCI Chemtech. The Compliance Agreement expired in fall 2000 when HCI Chemtech's probation for criminal violations at its Birmingham Road facility ended. Quarterly monitoring of groundwater is being conducted. No additional characterization or remedial action occurred in fiscal 2002.

General Geologic and Hydrologic Setting:

The HCI Chemtech-St. Louis Site is underlain by 18 to 35 feet of moderately- to highly-permeable fill material composed of sand, silt, slag and rubble. The fill is underlain by 5 to 20 feet of moderately- to highly-permeable alluvial sediments composed of clayey silts and sands. The alluvial sediments, in turn, are underlain by the moderately-permeable, Mississippian-age Ste. Genevieve Limestone. The depth to bedrock beneath the site is

about 40 feet, with depth increasing toward the Mississippi River.

Shallow groundwater beneath the site is recharged through infiltration of precipitation and through discharge from surrounding bedrock. The direction of groundwater flow is generally to the east toward the Mississippi River, with hydraulic gradient and actual groundwater flow direction dependent upon fluctuating river levels.

Because the site is located in a groundwater discharge setting, contaminants from the site will not likely impact the underlying bedrock. However, significant potential exists for site contaminants to discharge to the Mississippi River.

Public Drinking Water Advisory:

No public drinking water wells are affected by this facility. The nearest surface water intake is over 30 miles downstream and could only be affected by a very large release.

Health Assessment:

Toluene and several other polycyclic aromatic hydrocarbons (PAHs) (benzo(a)anthracene, benzo(k)fluoranthene, benzo(a)pyrene and indeno(1,2,3-cd)pyrene) have been detected in the soil at concentrations exceeding health-based screening levels. They have also been detected in the groundwater under the site. These PAHs can act as primary irritants to the mucous membranes, causing pulmonary edema, pneumonitis and hemorrhaging in the respiratory system. They may also cause central nervous system depression. Some have been linked to organ damage and cancer.

In order to accurately assess the impact this site may have on public health, the site needs to be characterized more thoroughly. Until further site characterization is conducted, it should be assumed that this site poses a potential health threat.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

HCI Chemtech-Stillwell Street



Site Name: HCI Chemtech-Stillwell Street

Classification: Class 2

Date of Placement: August 21, 1999

Address: 5200 Stillwell Street, Kansas City, Jackson County, Missouri, Sec. 23, T.5N, R.33W, North Kansas City Quadrangle

Present Property Owner: Brenntag, Inc.

Lead Agency: EPA and DNR

Waste Type: Volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs)

Quantity: Not determined

Site Description:

A bulk chemical storage and distribution facility has operated at the site since 1981. The site occupies 6.5 acres along the northern bank of the Missouri River levee in a mixed commercial and industrial area. Residences are located approximately one-half mile from the site. On-site structures include an office, warehouse and tank farms that contain about 50 aboveground storage tanks (ASTs).

Bulk chemicals are delivered to the facility by trucks and rail cars and are stored in ASTs. Chemicals may be mixed, repackaged prior to sale, or sold in bulk. Releases and spills are the probable source of contamination of soils and groundwater.

Environmental Problems and Areas of Concern Related to Site:

The site is in the Missouri River flood plain. VOCs and SVOCs were detected in groundwater at concentrations above health-based screening levels. Groundwater contaminants originating on the HCI Chemtech property are migrating off site to the north. Site contaminants potentially could discharge to the Missouri River.

Remedial Actions at Site:

In July 1997, a former owner and operator of the site, Unocal Corporation, enrolled the Stillwell Street facility in the Missouri Department of Natural Resources' Voluntary Cleanup Program (VCP) to investigate and remediate on-site contamination that occurred during its occupancy.

Following a release of sodium hydroxide in September of 1995 at the Birmingham Road

facility, HCI Chemtech, the site owner, was indicted for criminal violations of the Clean Water Act, of the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA) and of the Resource Conservation and Recovery Act of 1978 (RCRA). HCI Chemtech pled guilty to one violation of the Clean Water Act and was placed on probation. As a special condition of probation, HCI Chemtech was required to adopt corporate and compliance monitoring programs for each of its facilities in Missouri, including the HCI Chemtech-Stillwell Street Site. A Compliance Agreement, entered into by HCI Chemtech, the U.S. Attorney's Office, the U.S. Environmental Protection Agency (EPA), and the department, effective November 7, 1998, specifies that HCI Chemtech shall investigate and characterize its sites. Because such investigations are required of HCI Chemtech under an enforcement action, in accordance with Sections 260.565 through 260.575 RSMo, the site was no longer eligible for participation in the VCP. On February 18, 1999, Unocal's participation in the VCP was terminated .

In June 2000, a Remedial Investigation Workplan was submitted. In the fall of 2000, Brenntag, Inc., purchased HCI Chemtech. The Compliance Agreement expired in fall 2000 when HCI Chemtech's probation for criminal violation at its Birmingham Road facility ended. Additional monitoring wells were installed in fiscal 2001 to better define contamination and to determine the effects of variation in groundwater elevation due to fluctuation of the Missouri River level. Quarterly monitoring of groundwater is being conducted.

General Geologic and Hydrologic Setting:

The HCI Chemtech-Stillwell Street Site is located within the 20-year flood plain along the south side of the Missouri River. The topography is generally level.

The site is underlain by about 120 feet of moderately- to highly-permeable alluvium composed of interbedded sand, gravel and clay. The alluvium is underlain by the Pennsylvanian-age Kansas City Group, which is composed of interbedded limestones and shales with low to moderate permeability.

The alluvial aquifer receives recharge through surface water infiltration, as well as through discharge from the surrounding Pennsylvanian-age bedrock. In general, groundwater within the alluvium flows toward the Missouri River, with hydraulic gradient and actual groundwater flow direction dependent upon fluctuating river levels. Site contaminants could potentially discharge to the Missouri River.

Public Drinking Water Advisory:

The nearest public drinking water wells are 7 miles downstream of the Stillwell Street facility in Courtney Bottoms along the Missouri River. The nearest surface water intake downstream of the Stillwell Street facility is over 40 miles away. No drinking water sources are immediately impacted by the site. However, the site is impacting potentially usable groundwater.

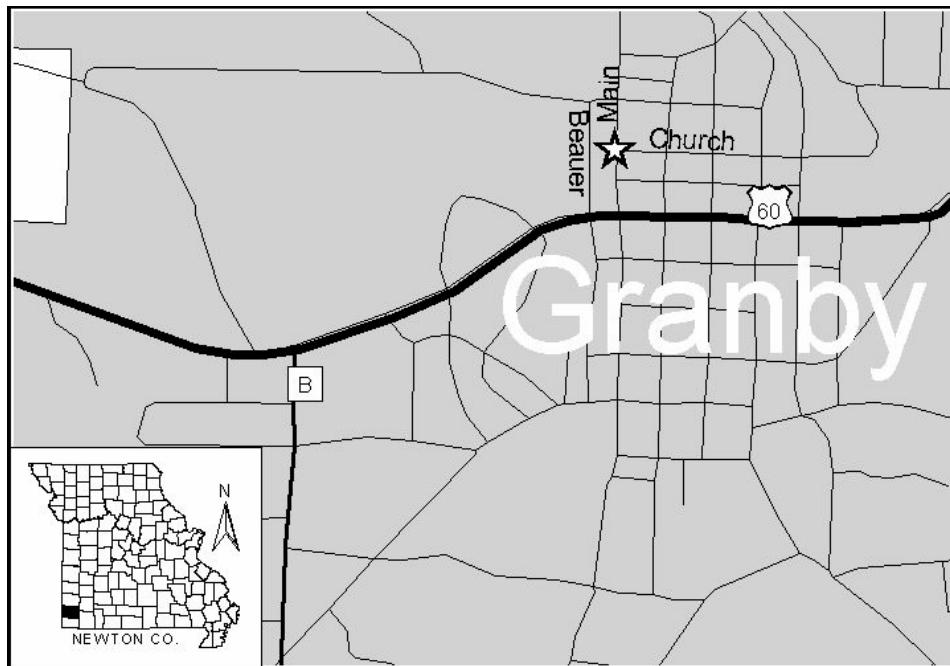
Health Assessment:

Concentrations of benzene, toluene, ethylbenzene and xylene in groundwater exceeded the EPA's drinking water standards, the Maximum Contaminant Level. Other substances found include dichloromethane, vinyl chloride, 1,1-dichloromethane and acetone. Although groundwater is contaminated, no private wells exist in the area.

Benzene is a known human carcinogen. Many of the substances at this site are volatile organic compounds which cause central nervous system depression. Dichloromethane causes eye irritation and digestive system effects when ingested. Vinyl chloride is known to cause liver cancer in humans. Based on available information, the site represents a human health threat, with on-site workers being at greatest risk.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

R&O Processors/Lux Theater



Site Name: R&O Processors/Lux Theater

Classification: Class 2

Date of Placement: October 9, 1996

Address: Church and Main, Granby, Newton County, Missouri, SE 1/4, NE 1/4, NW 1/4, Sec. 6, T.25N, R. 30W, Granby Quadrangle

Present Property Owner: Granby Economic Property Development Corporation

Lead Agency: EPA

Waste Type: Metal plating wastes (lead, cadmium, zinc, chromium, cyanide, nickel and copper)

Quantity: Not determined

Site Description:

The R&O/Lux Theater Site is an abandoned electroplating facility located in Granby's downtown area. From 1973 to 1981, R&O Processors operated a metal-finishing plant at the site of the former Lux Theatre. Plating operations included zinc, chromium, nickel, black oxide, cadmium and anodizing aluminum plating. R&O allegedly disposed of

sanitary and metal-finishing rinse water down a 40-foot deep shaft. In 1985, part of the building collapsed, which necessitated demolition of the entire building. Subsequently, several drums containing hazardous waste were found in the building rubble. Soil sampling revealed elevated levels of cadmium, chromium, copper, cyanide, lead, nickel and zinc.

The foundation of the former building that housed R&O Processors has been encased in clean concrete but remains visible. A gun repair shop occupied the building adjacent to the property on the south. An alleyway separates the foundation from a residence to the east. Main Street is the western border of the site; Church Street is the northern border of the site.

Environmental Problems and Areas of Concern Related to Site:

While R&O Processors operated the site, an estimated 6,000,000 gallons of metal-plating rinse water were dumped down a 40-foot deep mining shaft on site. This number was obtained by calculating that 15,000 gallons of rinse water per week were disposed of on site over an eight-year period. Documented in a complaint by the U.S. Environmental

Protection Agency (EPA) filed against Robert Moffet, former operator of the site, Moffet acknowledged that the rinse waters contained cyanide and metals.

In 1993, the EPA hired Jacobs Engineering Group to evaluate the site according to Site Inspection Prioritization guidelines. The study concluded that cadmium, lead and zinc are present in the soils at concentrations that exceed health-based screening levels. Groundwater has not been thoroughly evaluated.

The site is unsecured. Due to the site's location in downtown Granby, it is readily accessible to the public.

Remedial Actions at Site:

In spring 2001, the property was donated to the Granby Economic Property Development Corporation. The redevelopment plan to encapsulate contaminated soil and concrete with a concrete foundation for two new buildings that will house a mining museum and visitor center was approved in May 2001. In July 2001, the first phase of work was conducted by the new site owner. One upright foundation was pushed over and left in place as fill. The old building's other upright foundation walls were encapsulated in clean concrete. Gravel was placed over the majority of the empty lot next to the old building. Future plans include pouring a new basement floor in the old building; pouring a concrete foundation in the empty lot next to the old foundation; and adding several inches of clean soil to the strip of grass between the old building and the street.

General Geologic and Hydrologic Setting:

In general, the topography is characterized by uplands gently sloping to stream valleys. The site is located in an urbanized area, where the topography has been altered by cut and fill excavation to provide a level surface for building construction. Natural surface soil is composed of cherty, red clay residuum, which ranges from 10 to 40 feet in thickness. The soil is derived from weathering of the underlying bedrock. Generally, the fill is similar to natural soil, and both exhibit moderate to high permeability.

The upper aquifer is composed of Mississippian-age strata, which are primarily limestone units with a total thickness of 250 to 300 feet. The lower aquifer, encountered about 800 feet below grade, is composed of sandstone and dolomite units of Ordovician age. The upper and lower aquifers are separated by confining beds composed of shale. The limestone and dolomite units are highly permeable due to solution enlargement of bedding planes and joints. The local area is karst, characterized by sinkholes, losing streams, springs and caves.

Most private residences obtain water from low-yield wells that penetrate the upper bedrock aquifer and, in some cases, the overlying residuum. Water supply wells that require high yields, such as municipal wells, penetrate the lower aquifer. Poorly-constructed wells may facilitate migration of contaminants from the ground surface to the deeper, potable aquifers.

Public Drinking Water Advisory:

Three wells serve the city of Granby. The nearest well is 0.25 miles to the southeast, at Grove Street and U. S Highway 60. The other wells are 0.5 miles to the west and 0.9 miles to the southwest. All three wells are cased to a minimum of 337 feet and have not shown any signs of contamination. Precaution should be taken to prevent contamination of the community's source of drinking water.

Health Assessment:

Cadmium is a known animal carcinogen and suspected human carcinogen. It attacks the lungs, kidneys, blood, respiratory tract and prostate, and it produces teratogenic effects. Chromium attacks the blood, liver, kidneys, eyes, skin and respiratory system. Some forms are human carcinogens. Copper is a skin irritant that may also cause gastrointestinal disturbances. Cyanide attacks the liver, kidneys and central nervous system (CNS) and has been shown to cause weakness, headaches, confusion, nausea, vomiting, eye and skin irritation, and respiratory effects. Lead attacks the CNS, kidneys, blood, gastrointestinal tract and gingival tissue. Prolonged exposure can cause irreversible damage. Nickel attacks the

respiratory tract and causes skin dermatitis. Some forms are also known animal and suspected human carcinogens. Some forms of zinc are known animal and suspected human carcinogens and may affect the peripheral nervous system.

The primary health concerns are contaminated groundwater and soil. A subdivision well, located east of the site, has been found to contain lead, and a private well near the site contains lead and cadmium above public drinking water standards. Groundwater apparently flows northward toward a losing stream. The proximity of the site to the municipal well and the karst

geology of the area both contribute to concern regarding the site. The addition of gravel and concrete to the site by the new owners reduces the potential for exposure through contaminated soil.

Based on available information, wells near the site may be at risk. Additional work is needed to fully assess this risk.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Riverfront Landfill



Site Name: Riverfront Landfill

Classification: Class 2

Date of Placement: January 14, 1984

Address: Levee Road at Chouteau along the south bank of the Missouri River from River Mile 363.5 to 359.0, Kansas City, Jackson County, Missouri, NW 1/4, Sec. 27; SE 1/4, Sec. 22; N 1/2, Sec. 17; N 1/2, Sec. 16; SW 1/4, NW 1/4, NE 1/4, and SW 1/4, Sec. 15, T. 50N, R. 33W, North Kansas City Quadrangle

Present Property Owner: Kansas City Power & Light Company

Lead Agency: EPA

Waste Type: Metals, volatile organic compounds (VOCs) and semi-volatile organic compounds (SVOCs)

Quantity: Not determined

Site Description:

The Riverfront Landfill in Kansas City, Missouri, contains a wide variety of hazardous wastes. The 492-acre site operated as a municipal landfill from 1950 until 1972. No

attempt was made to regulate the types of waste disposed at the site, nor were any records maintained about the wastes dumped there. In the summer of 1992, a portion of the landfill was capped. The western portion of the landfill was developed as a city park.

Environmental Problems and Areas of Concern Related to Site:

Due to the site's history, the quantity and type of waste disposal, and the hydrogeologic setting of the area, groundwater contamination is possible. This site lies in the Missouri River alluvium. The depth to groundwater is 7 feet. The site was excavated to the water table and filled without the benefit of a liner, so infiltrating materials are likely to contaminate groundwater. Groundwater is used locally for industrial processes. Due to burning of liquid wastes at the site, polychlorinated dibenzofurans may have resulted from the burning of polychlorinated biphenyls (PCBs), which are environmentally persistent.

Surface runoff is toward the Missouri River. At one time, final cover material eroded, exposing solid wastes, which entered the Missouri River. Kansas City corrected the problem. This situation did not appear to

involve the release of hazardous waste. The principal concern is the potential for direct human contact with contaminated surface soils. Soil samples collected by the Kansas City Health Department documented elevated lead levels. Data on soil contamination is limited to the west end of Area I, also known as Riverfront Park.

The 2001 annual Registry site inspection report noted that the area east of Chouteau was fenced with locked gates. West of Chouteau, the road north of the old gate to old Riverfront Park was littered with trash, including discarded furniture and carpet. Concrete and cable barriers are present along the edge of this road to restrict access to discourage dumping. These conditions were referred to the Missouri Department of Natural Resources' Kansas City Regional Office Solid Waste Unit for investigation.

Remedial Actions at Site:

In August 1982, surface and subsurface soil samples were taken to establish types and levels of chemical contaminants. Inorganic metals were found at higher levels than the expected range in alluvial soils. VOCs were found above detection limits. PCB was detected at levels well below the 50 parts per million (ppm) Toxic Substances Control Act standard for old disposal sites. The U.S. Environmental Protection Agency (EPA) installed shallow groundwater monitoring wells to investigate potential groundwater contamination. Samples collected by the city in 1984 indicate soils contain concentrations of lead from 49 to 8,000 ppm.

An Administrative Order on Consent was issued to the city of Kansas City by the EPA in July 1987 under Sections 3013 of the Resource Conservation and Recovery Act and 106 of the Comprehensive Environmental Response, Compensation and Liability Act. This Order required the city to conduct groundwater monitoring, to keep the site closed to the public, and to clean up or cap lead-contaminated soil once the groundwater monitoring had been completed.

Groundwater was sampled in January and April 1988. In each round, 18 monitoring wells were sampled. Arsenic, barium, chromium,

lead, benzene and vinyl chloride were detected in groundwater at concentrations above the EPA's drinking water standards, the Maximum Contaminant Levels.

In February 1990, the city of Kansas City submitted a final Groundwater Investigation report for Riverfront Landfill with a Groundwater Risk Assessment. Groundwater contour maps indicate that, under normal flow conditions, groundwater flow is toward or parallel to the river across the meander. Under abnormally high flow conditions, groundwater flow may be away from the river.

The city planned to cap surface soils contaminated with lead above 500 ppm and reopen Riverfront Park as a recreational use public park. The Missouri Department of Health and Senior Services agreed that capping areas of Riverfront Landfill with lead concentrations above 500 ppm would be protective of human health and the environment, provided that the site remain on the Registry. The site was enrolled in the department's Voluntary Cleanup Program, but was withdrawn in 1999, with no progress made toward characterization.

Areas II and III are fenced with signs posted around the fence perimeter indicating the site is a hazardous waste site. Area I was capped during the summer of 1992 by the city of Kansas City. The flood of 1993 damaged the fence in some areas and impacted the cap; both were repaired. During fiscal 1998, a portion of the capped area was disturbed as a result of the Chouteau Bridge relocation. A change of use request was approved for the disturbance. Work on the Chouteau Bridge has been completed in the affected area of the landfill. The city continues to monitor groundwater at the site.

The city requested a change of use in January 1999, for the installation of a stormwater drainage through the landfill. The change was approved, and planning continues. To date, no site work has been scheduled.

The department approved installation of a stormwater pumping station in January 2000. During fiscal 2001, Kansas City submitted a change of use request for maintenance on an outfall pump, including removal of silt and

brush from a ditch near the outfall pump. The change was approved.

General Geologic and Hydrologic Setting:

The site is on the Missouri River flood plain. Soil texture may range from clay to sand, but for the most part, the soils are made up of predominantly coarse material with moderate to high permeability.

The site sits directly atop the Missouri River alluvium, which is an important groundwater source for the area. The alluvium is recharged through surface infiltration from rainfall and runoff from adjacent areas, as well as from the river during high river stages. Some recharge may also be received from surrounding and underlying bedrock. In general, the direction of groundwater flow in the alluvial system is toward the river, often with a strong downstream component. However, flow direction may be affected by river stage.

Public Drinking Water Advisory:

Alluvial groundwater in the immediate vicinity is potentially usable as a drinking water supply, but no current usage is nearer than the alluvial wells located four miles downstream serving the city of Independence. The nearest public water system surface water intake is at Lexington, 37 miles downstream. This site may affect the water quality of the Missouri River, but poses little direct threat to downstream public water systems.

Health Assessment:

The following are the major contaminants of concern: benzene, beryllium, bromodichloromethane, chlorobenzene, chloroform, chromium, 1,2-dichlorobenzene, 1,3-dichlorobenzene, 1,4-dichlorobenzene, 1,1-dichloroethane, 1,2-dichloroethene, ethylbenzene, lead, mercury, selenium, 1,1,2,2-tetrachloroethane, toluene, 1,1,2-trichloroethane, trichloroethylene and vinyl chloride. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

It is difficult to assess the exposure of people using the park. People who engaged in soil-disturbing activities such as riding three-wheelers or digging fishing worms, or who frequented areas where vegetative cover was lacking, would probably have received the highest exposures, but the significance of these exposures is unknown. The undeveloped portion of the landfill received fewer visits, but still showed evidence of frequent visits by the public.

The study population for this site is the residents within the zip code 64120. Cancer deaths for years 1983 to 1993 for the study population were compared to statewide cancer deaths. Based upon age-specific cancer death rates, expected cancer deaths were calculated for the site. Using chi-square analysis, the observed number of deaths for total cancer overall was not significantly different than the expected value. Overall cancers which were significantly higher than expected were larynx and lung. In the 65+ population, larynx and lung cancers were significantly higher than expected.

Two natality studies (1980 to 1989) and (1990 to 1994), found no rates significantly different than state averages. Natality data for an earlier period (1972 to 1982), had revealed a rate of congenital anomalies significantly higher than the state rate.

Although the potential for human exposure to the landfill is lower since the park has been closed, some people continue to use the area despite the closure. Evidence such as open gates, stolen warning signs, and illegal dumping indicate that the former park and other areas of the landfill are still being used. A serious health risk still exists at this site. Periodic flooding and the now completed construction of the new Chouteau Bridge, which required extensive ground disturbance, have minimized the effectiveness of previous remediation efforts.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Syntex - Springfield



Site Name: Syntex - Springfield

Classification: Class 2

Date of Placement: January 1, 1984

Address: 2460 West Bennett Street,
Springfield, Greene County, Missouri NW 1/4,
SW 1/4, NE 1/4, SW 1/4, Sec. 27, T. 29N, R.
22W, Springfield Quadrangle

Present Property Owner: Clariant LSM
(Missouri), Inc.

Lead Agency: DNR (post-closure lead and
technical lead for corrective action), EPA
(administrative corrective action lead)

Waste Type: Volatile organic compounds,
semi-volatile organic compounds and 2,3,7,8-
TCDD (dioxin)

Quantity: Not determined

Site Description:

This site is an active chemical manufacturing facility. Currently, the site is fenced with 24-hour security. Hazardous wastes generated by past plant processes were managed in a surface impoundment at the facility. The

impoundment was operated from the late 1950's until the early 1970's as a settling pond in conjunction with on-site wastewater treatment. The impoundment was then used for management of hazardous wastes from the early 1970's until 1982, when it was decommissioned.

Partial closure of the southern portion of the impoundment was completed in 1975 by filling it with native soil, rock and concrete. An interim hazardous waste concrete storage pad was then constructed on top of the closed portion of the impoundment. The remainder of the impoundment was physically closed in 1985, under a Closure Plan approved by the Missouri Department of Natural Resources.

Environmental Problems and Areas of Concern Related to Site:

The primary environmental problems are hazardous wastes and hazardous waste constituents that have been released from the former surface impoundment. The vertical and horizontal extent of soil and groundwater contamination has been determined.

The aqueous phase liquid (APL) plume volume is unknown. The horizontal and vertical extent of the APL plume generally

parallels the dense aqueous phase liquid (DNAPL) plume.

The fact that this site is located in Springfield, at the confluence of Fassnight, Jordan and Wilson Creeks, gives it high priority relative to the extent of contamination and potential threat to public health and the environment.

Jordan Creek runs along the eastern edge of the site, joining Fassnight Creek at the southern site boundary to form Wilson Creek. The department has sampled water from Wilson Creek and area drinking water wells. Results of these analyses have shown no contamination attributable to releases at the facility.

Remedial Actions at Site:

In September 1983, Syntex alerted the department and the U.S. Environmental Protection Agency (EPA) that various site investigation and groundwater monitoring activities confirmed the release of hazardous waste constituents to soil and groundwater from the surface impoundment. On September 14, 1983, the department issued an emergency directive to Syntex requiring the company to: (1) immediately install a portable water treatment system; (2) immediately eliminate all discharges of wastewater into the impoundment; (3) immediately install aboveground, lined containment tanks; (4) pump water from the impoundment through the portable water treatment system; and (5) sample the treated water and report the results to the department.

Syntex implemented the emergency directive. Water was removed from the impoundment and treated. After analysis showed the treatment was effective, the treated water was discharged into the Springfield sewer system. A concentrated sludge remained on the bottom of the lagoon.

On September 20, 1983, the department issued an order to Syntex that required the company to submit to the department and the EPA a closure plan for the surface impoundment and a remedial action plan for cleanup of contamination in the alluvium and groundwater. The order also required installation of new monitoring wells at the

facility to better determine the extent of contamination. Following the department's review of the closure and remedial action plans, the plans were approved on July 6, 1984.

Syntex initiated steps to close the surface impoundment by treating contaminated water, stabilizing and excavating contaminated sludge and placing the contaminated solids in a large reinforced concrete storage area permitted under the Resource Conservation and Recovery Act (RCRA). In 1988, the stored solids were removed from the storage tank and incinerated at the Denney Farm Site. Following the initial stabilization and removal of contaminated soil and sludge, verification sampling was performed to ensure adequate solids removal, a french drain was installed in the floor area of the impoundment, and the remainder of the impoundment was filled with clean, compacted clay and capped with gravel. In February 1986, the department indicated that filling the impoundment and putting a liner over the top of the impoundment did not constitute a final closure, nor did it represent a completion of all remediation that may be necessary, due to the hazardous constituents left in place. Therefore, clean closure was not granted at that time. In 1989, a concrete cap was added over the area of the former impoundment.

Since, Syntex has been operating under a department-approved post-closure plan, due to the hazardous waste constituents left in place. This plan requires continued groundwater monitoring for previous releases from the former impoundment. In addition, Syntex has addressed further investigation, monitoring and remediation of groundwater and soil contamination at the facility under the terms of a RCRA Corrective Action Order on Consent, negotiated between the EPA and Syntex. Syntex completed a RCRA Facility Investigation (RFI) work plan that was approved by the EPA and the department. The scope of the RFI included the following: (1) characterize the potential pathways of contaminant migration; (2) characterize the source(s) of contamination; (3) define the degree and extent of contamination; (4) identify actual or potential receptors; and (5) support and develop or refine the corrective measures.

The RFI was completed in June 1995, and the final report was approved by the department and the EPA in July 1996. The Corrective Measures Study (CMS) was initiated in late 1996. Several draft reports were submitted to the department and the EPA. A final CMS Report was submitted to the department in January 2002.

Syntex's RFI has demonstrated that, currently, contaminated groundwater is captured by pumping wells, and contamination is confined within the facility property boundary. RFI evaluations, including dye trace studies performed by the department's Geological Survey and Resource Assessment Division, showed no detection of water from the contaminated area of the plant in the on- or off-site creeks or in area springs.

Syntex has an ongoing groundwater extraction and treatment system in place. Contaminated groundwater is being recovered via four extraction wells and the french drain. This water is treated in Syntex's water treatment plant by polymer coagulation, air stripping, and carbon absorption. The treated water is then stored in tanks, tested and released to Springfield city sewers.

Currently, 68 groundwater monitoring wells exist at the site, with extraction to be rotated among eight or more of these wells. Sixty-two wells monitor five distinct hydrologic zones at the site: 21 monitor the alluvium (0 to 20 feet below ground surface, or 'fbgs'), 18 monitor the upper Burlington formation (20 to 130 fbsgs), 13 monitor the lower Burlington formation (130 to 180 fbsgs), 5 monitor the Elsey formation (180 to 240 fbsgs), and 5 monitor the Pierson formation (240 to 280 fbsgs). Monitoring was also performed below the Ozark confining unit in the Upper Ozark Aquifer for five years, with results indicating no contamination from on-site chemicals.

Evaluation of alternatives for a final remedy is underway. The site has been capped and covered, with a storage building erected over the old lagoon site. The department is the lead agency for corrective action through a corrective action transition plan with the EPA.

General Geologic and Hydrologic Setting:

The Syntex facility, including the location of the former surface impoundment, is located on the flood plain of Jordan Creek near the junction of Jordan and Fassnight Creeks.

The unconsolidated surficial materials at the site consist of 5 to 16 feet of fill material composed of silty, gravelly clay with minor amounts of sand. The fill is underlain by 0.5 to 20 feet of silty clay alluvium, containing interspersed sand and gravel zones. Permeability of the alluvium varies based upon composition, with highest permeability in the sand and gravel zones.

Groundwater generally occurs at 8 to 15 feet bgs within the fill and alluvium. The direction of groundwater flow within the alluvium is generally toward Jordan Creek. Fassnight and Jordan Creeks, which become Wilson Creek at their confluence, appear to be gaining streams in the vicinity of the site.

Bedrock immediately underlying the alluvium is the Mississippian-age Burlington-Keokuk Limestone. The cherty limestone extends to a depth of approximately 280 feet to the top of the Northview Formation. Regionally, the Northview Formation is considered to be a confining layer that separates the shallow Mississippian-age limestones from the deeper Ordovician-age dolomites and sandstones.

Monitoring wells have been installed in several different horizons within the alluvium and limestone bedrock. Water level information from these wells indicates a good hydraulic connection between the alluvial sediments and the upper shallow bedrock. Water levels in wells installed in deeper horizons of the shallow bedrock aquifer indicate a poor or very poor connection. These wells have significantly lower water levels and very low yields. These facts, together with the pumping test data, suggest that low-permeability zones exist in the lower part of the shallow bedrock.

Both the alluvium and the shallow bedrock aquifer have been affected by contamination. Because contaminants have been observed in

several of the deeper monitoring wells, it can be assumed that downward migration of contaminants has taken place.

Public Drinking Water Advisory:

The actual threat posed by the site contaminants is minimal at the present time. Contaminants have not been detected in creek waters and are contained within facility property boundaries. No chemicals from the site have been detected in off-site creeks, springs, shallow bedrock wells or deep bedrock wells. The regional potable water source, the Ozark Aquifer, has not been impacted by site chemicals. The shallow bedrock portion of the bedrock, which has been impacted by site chemicals, is known to be contaminated regionally by area septic tank effluents, agricultural chemicals, and industrial activities, and does not produce sufficient yields to use as a potable water source. Piped city water is used by the public in areas hydraulically downgradient from the site.

Health Assessment:

The following are the major contaminants of concern found at the site: arsenic, barium, benzene, bis(2-ethylhexyl)phthalate, cadmium, carbon tetrachloride, chloroform, chromium, 1,2-dichloroethane, trans-1,2-dichloroethene, 2,4-dimethylphenol, dioxin (2,3,7,8-TCDD), ethylbenzene,

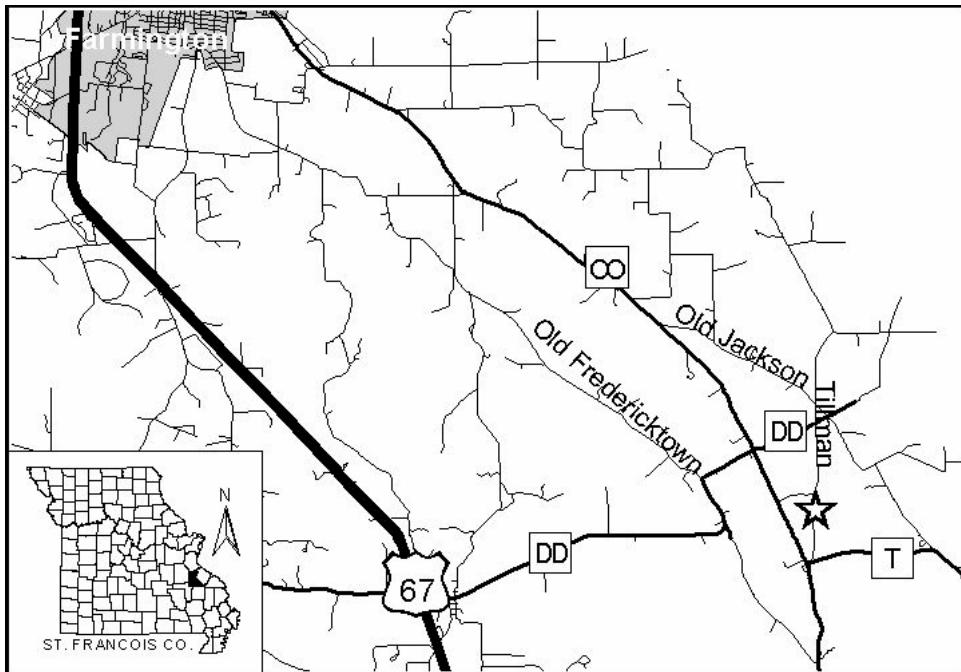
fluoranthene, lead, manganese, methylene chloride, naphthalene, nickel, phenanthrene, pentachlorophenol, phenol, selenium, toluene, trichloroethylene and xylenes. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

Ingestion and direct contact are the primary routes of exposure since chemicals have leached into groundwater and Jordan Creek, which is adjacent to the facility. Although the area is served by public water, the possibility exists for contaminated groundwater to appear in wells and springs some distance from the site. Inhalation of chemical fumes is also a possibility.

The area expected to be most affected by surface and subsurface movement of chemicals off site would be Jordan and Wilson Creeks. Currently, it seems that no detectable exposure to hazardous chemicals is occurring from the site, but the possibility exists for future exposures.

Based on available information, a public health threat exists due to the adverse health effects of dioxin and other known chemicals. For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Tillman House



Site Name: Tillman House

Classification: Class 2

Date of Placement: September 24, 2001

Address: Tillman Road near Highway OO and T about nine miles south of Farmington, St. Francois County, Missouri

Present Property Owner: Lindell and Lola Clubb

Lead Agency: DNR

Waste Type: Volatile organic compounds (VOCs)

Quantity: Not determined

Site Description:

The Tillman House Site is the location of the former North American Airborne Allergens, Inc. (NAAA), a company that used tetrachloroethylene (PCE) and acetone in the processing of pollens for pharmaceutical use from 1975 until 1989. During the period that the NAAA operated at the site, PCE and acetone were burned with trash at an on-site burn area and may have been spilled on site.

The site occupies 15 acres in a rural area. An unnamed intermittent stream flows through the center of the property and enters the Little St. Francis River at the northwest corner of the property. Currently the site is used as a residence with several structures including the historic Tillman House, a foundation from the former Weidert house, a barn, and a mobile home.

Environmental Problems and Areas of Concern Related to Site:

Soil, groundwater and surface water have been contaminated with PCE. The PCE spilled at the site is designated as EPA hazardous waste U210. The listed hazardous waste was detected in groundwater and surface water at concentrations up to 1,640 parts per billion (ppb), exceeding the Missouri Department of Natural Resources' Cleanup Concentration of 5 ppb PCE. Trichloroethylene (TCE) is present in groundwater at concentrations up to 81.9 ppb.

As long as the filter on the contaminated well is serviced regularly, no exposure to contamination from that well exists. Potential exposure to contaminated water in the stream remains a concern; one surface water sample collected from the intermittent stream

documented PCE at 774 ppb and TCE at 9.6 ppb. Also of concern is the potential contamination of the neighboring well south of the site. This well is located approximately 500 feet from the site and was never sampled due to denied access.

Remedial Action at the Site:

A 1996 combined Preliminary Assessment/Site Inspection (PA/SI) investigation by an EPA contractor recommended a removal action due to the presence of PCE and TCE in the on-site private drinking water well. PCE was also detected in soil samples during the PA/SI. In August 1998, a Removal Assessment determined that the site met the criteria for a removal action. As a result, the EPA installed a carbon filtration system for the on-site drinking water well.

In 1999, the department initiated a Site Reassessment (SR) to assess the existing levels of contaminants. SR sampling revealed that VOCs were breaking through the carbon filtration system on the private well. The site owner was not changing the filter on a regular basis. The EPA discussed the issue with the site owner, and the filter will be serviced regularly. The SR investigation concluded that on-site soils, groundwater and surface water contain PCE, TCE, and cis-1,2-DCE. The removal action performed by the EPA eliminated exposure to contaminated groundwater in the drinking water well; however, contaminated soil remains and will continue to impact groundwater and surface water. Further action under CERCLA authority was not recommended at the time of the SR, provided that institutional controls are in place and state oversight of future activities is ensured.

General Geologic and Hydrologic Setting:

The site, located on the eastern fringe of the Salem Plateau portion of the Ozark Plateau physiographic province, is situated on a gently rolling surface. An intermittent creek crosses the site from the east to the northwest and enters the Little St. Francis River immediately northwest of the site.

The site is underlain by the Cambrian-age Bonneterre Formation. The Bonneterre

Formation is composed of dolomite, is characterized by a pinnacled erosional surface, and is overlain by approximately 10 feet of silt and silty clay (loess) and clayey materials. Examples of minor karst, such as losing streams, seeps and springs, have been reported near the site. Large joints (bedrock fractures) observed in the bedrock exposed in the Little St. Francis River may be related to geologic structures underlying the site (Libertyville Graben) and more distant northwest/southeast trending fault zones.

The Cambrian-age Bonneterre Formation and the underlying Lamotte Sandstone form the St. Francois Aquifer. In areas like the eastern part of the Ozark province, adjacent to the east side of the St. Francois Mountains groundwater province (also the recharge area for the St. Francois Aquifer), the St. Francois Aquifer is important because it is the only local source of groundwater available. The water table is expected to be about 10 feet below the ground surface near the contact between soil and bedrock. The direction of groundwater flow may be controlled by joints but is likely to be generally toward the northwest, with discharge occurring to the Little St. Francis River.

The intermittent creek, which crosses the site, enters the westward flowing Little St. Francis River. The Little St. Francis River continues to flow to the west then turns south, where it joins the St. Francis River. The St. Francis River eventually empties into the Mississippi River in eastern Arkansas.

Public Drinking Water Advisory:

No public water supplies are affected by this site. The nearest public well formerly served the Libertyville Elementary School 1 mile to the north. This well has not served as an active public source since 1994.

Health Assessment:

PCE is a central nervous system depressant that is a known animal and suspected human carcinogen. Acetone can cause irritation of the eyes, nose, and throat, headache, and dizziness.

Ingestion, inhalation, and dermal contact with PCE and its degradation products through contaminated groundwater are the major concerns at this site. PCE concentrations in groundwater range up to 1,640 ppb. An on-site well that is used for drinking water contains both PCE and TCE.

Based on available information, a serious health risk exists at the site. While the contaminated well has a carbon filtration system, the system has not been properly maintained, and human exposure has

occurred. The department has concluded that there is sufficient soil contamination on site to continue contaminating groundwater. An off-site investigation should be performed to determine if wells are present in the vicinity, and if so, if they have become contaminated.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

University of Missouri - South Farm



Site Name: University of Missouri - South Farm

Classification: Class 2

Date of Placement: January 1, 1984

Address: Along Rolling Hills Road, southeast of Columbia, Missouri, NE 1/4, SE 1/4, NW 1/4, Sec. 34, T. 48N, R. 12W, Boone County, Columbia Quadrangle

Present Property Owner: University of Missouri

Lead Agency: DNR

Waste Type: Laboratory wastes, waste solvents, farm chemicals, and radioactive waste

Quantity: Undetermined amounts of waste, because wastes were subject to open burning and only residues remain.

Site Description:

The University of Missouri-South Farm Site is an abandoned hazardous waste site used by the University to burn laboratory wastes and solvents from 1967-1978. The residues from

this process were buried on site. The site is located in the University of Missouri - Columbia's experimental farm. The entire area is well-vegetated. The site is about 20 feet from a rural paved road. Although the site was located in rural Boone County at the time of disposal, recent development has made the site part of a rural residential area. No homes are immediately adjacent to the site; however, a house is located within 0.1 miles from the site.

The area that had been used for hazardous waste disposal is now capped and vegetated. Empty drums and drums of purge water are stored on site.

Environmental Problems and Areas of Concern Related to Site:

Shallow groundwater contamination is a concern.

Remedial Actions at Site:

The entire farm is fenced to limit public access, and the disposal site is also fenced to prevent access by livestock. Signs identifying the site as a "Chemical Disposal Area" and warning "Keep Out" are on the gate and the fence.

The Missouri Department of Natural Resources completed a Site Inspection (SI) in 1991. The SI concluded hazardous substances are present in the buried trenches and shallow water contamination is occurring. The chemicals 2,4-D and 2,4,5-T were detected in water samples taken from the on-site borings at concentrations above the detection limit.

The University was accepted in the department's Voluntary Cleanup Program (VCP) in 1997 to further characterize the site and determine the need for remediation or monitoring. The University's planned site characterization work included drilling of three monitoring wells into bedrock to assess migration of the wastes from the burial site. The plan was approved in the spring of 1998.

In early spring 2000, the University's consultant performed an investigation pursuant to the 1998 work plan approved by the VCP. This involved both soil and groundwater. Monitoring wells were installed up- and down-gradient of the site to determine whether groundwater is impacted. Soil samples were taken as well as sediment and water samples from nearby Gans Creek.

Pursuant to the University's consent order with the EPA to investigate the site by the end of 2001, soil and groundwater investigations have proceeded during 2000-2001. Four monitoring wells have been installed at the site, and quarterly groundwater monitoring is planned until at least January 2002 to establish a baseline and observe trends in groundwater quality. Preliminary results indicate that groundwater in at least one well is contaminated with 1,4-dioxane, a mobile, water-soluble solvent used in scintillation counters. Gans Creek, which runs past the site, has been sampled and no contamination that is attributable to the site has been found.

Surface water and sediment samples collected from Gans Creek showed no detectable contaminants discharging to the creek. Surface soil samples collected from the burial area showed no detectable contaminants. However, shallow groundwater samples from temporary monitoring points contained 13 volatile organic compounds (VOCs) such as dichloroethane, benzene,

chlorobenzene and chloroform. Lower levels of 17 VOCs and chlorinated herbicides were found in bedrock monitoring wells at water level depths of 13 to 37 feet below ground. The chemical 1,4-dioxane was the only detected contaminant in the farthest down gradient well, closest to Gans Creek. However, due to its solubility and mobility, 1,4-dioxane would be expected to migrate more quickly than the other contaminants.

These results indicate that wastes buried at the site have migrated from the burial trenches. At this time, there is no evidence that the contaminants are reaching any receptors including Gans Creek or drinking water wells in the area.

General Geologic and Hydrologic Setting:

The site is located on a west-facing, moderately gentle slope. Gans Creek, which occupies the valley downslope, flows to the southwest and passes through Rock Bridge Memorial State Park, eventually merging with Clear Creek to form the Little Bonne Femme Creek, which then enters the Missouri River.

The soil underlying the site consists of a relatively thin layer of silt and silty clay of glacial origin. The total soil thickness above bedrock is estimated to be 8 to 20 feet.

Bedrock in the immediate vicinity is composed of Pennsylvanian-age cyclic deposits of sandstone, siltstone, shale, underclay, limestone, and coal. This bedrock, which is expected to be 20 to 40 feet thick, probably has low permeability.

Groundwater is obtained from two major bedrock aquifers in this area. The shallow bedrock aquifer, composed of Mississippian limestones, underlies the Pennsylvanian bedrock and provides low yields to private wells. The deep aquifer, composed of Cambrian- and Ordovician- age carbonates and sandstones, is isolated from the shallow aquifer by a thin layer of Devonian limestone, which acts as a "leaky" confining unit. The deeper aquifer is used as a source of public water supply and for other uses that require high yields. Poorly-cased wells may provide an avenue for downward migration for contaminants.

The low permeability of the glacial soil and overall low permeability of the Pennsylvanian bedrock are expected to prevent deep groundwater from being affected. Shallow, perched groundwater possibly exists in the glacial soil or at the top of the bedrock.

Perched water is expected to move horizontally, reappearing downslope and potentially affecting surface water in the Gans Creek watershed.

Public Drinking Water Advisory:

The site is about 1 mile southeast of two public drinking water wells serving the Columbia Environmental Research Center. Other public wells are located 1.75 miles from the site. All public wells in the area are cased to at least 400 feet. No effects on the public wells have been observed.

Health Assessment:

Xylene, pesticides, cleaning solvents, laboratory wastes, and possibly radioactive wastes are suspected to have been burned and buried at the site. Because concentrations of these residues are

unknown, it is difficult to estimate the health effects that might occur if persons were exposed to them. However, solvents and pesticides could cause central nervous system depression and some of them may be carcinogenic.

Exposure is only likely to occur through ingestion of contaminated groundwater. No residences for a distance of three miles are known to use groundwater for drinking water. No evidence of use has been discovered during site visits. The entire area that was used for waste disposal is now capped. Most of the site is well vegetated. As long as the cap is maintained, contact with contaminated soil is not considered a potential route of exposure.

Based on available information, there is limited potential for exposure to hazardous substances at the UMC South Farm site.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

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CLASS 3 SITES

Amoco Oil-Sugar Creek Refinery



Site Name: Amoco Oil - Sugar Creek Refinery

Classification: Class 3

Date of Placement: June 14, 1984

Address: 1000 North Sterling, Sugar Creek, Jackson County, Missouri. Five areas contained in Sec. 28, W 1/2, Sec. 27, N 1/2, Sec. 33, R. 32W, T. 50N of the Independence Quadrangle and N 1/2, Sec. 28, R. 32W, T. 50N, NW 1/2 Sec. 27, R. 32W, T. 50N of the Liberty Quadrangle

Present Property Owner: BP Products North America, Inc.

Lead Agency: DNR (post closure and technical corrective action lead); EPA (administrative corrective action)

Waste Type: Lead and lead compounds, cadmium, polycyclic aromatic hydrocarbons (PAHs), oil and sludges, chromium, arsenic, mercury, benzene, toluene, ethyl benzene, and xylene

Quantity: Not determined

Site Description:

This site is the location of a former active oil refinery. The Amoco Oil Refinery began operations in 1904 and ceased refinement of crude oil and production of petroleum products in 1982. The former refinery area consists of about 423 acres. Amoco now operates a marketing terminal and an asphalt plant on the property.

Five separate disposal areas of the Amoco property are listed on the Registry, which total about 22 acres. These areas are located next to the Missouri River. The registered areas include four inactive tank bottom disposal areas and one inactive sludge disposal area.

A land farm for the disposal of leaded gasoline storage sludge, near the river, has been identified by the EPA as having high concentrations of lead and chromium.

Environmental Problems and Areas of Concern Related to Site:

The location next to the Missouri River presents problems because of flooding and groundwater contamination. The principal discharge area for groundwater beneath the

site is the Missouri River. Surface soil contamination is widespread but is contained within berms. During the flood of 1993, the inactive sludge disposal area was covered by floodwater.

Groundwater contamination has resulted from past activities at the site. Groundwater discharge to the Missouri River has had minor impacts to the water quality. The Missouri River is used as a drinking water supply downstream, and the Missouri River alluvium supplies drinking water to a major municipality downstream.

Remedial Actions at Site:

Amoco Oil Company has developed and submitted a revised closure plan for the Resource Conservation and Recovery Act (RCRA) interim status units at the facility. These units are not part of the property that is listed on the Registry. The department approved the closure plan for the surface impoundments in September 1987. This approval was subsequently appealed by Amoco in October 1987 because of the cleanup level specified in the approval. Subsequent to the appeal, Amoco conducted a pilot scale biological treatment study of the surface impoundments. Amoco signed a consent decree order with the state of Missouri to use biotreatment as a remediation technology. Amoco used a stockpile composting process, combined with land treatment of solids, to treat the oily wastes from the single waste management unit (SWMU). In 1999, Amoco completed bioremediation of the SWMU and began capping the treated soil. Capping and other closure activities were completed in August 1999.

In late 1995, a modification was approved to augment the biotreatment system with a thermal desorption and vapor recovery unit (DRU). The DRU would reduce PAHs in the contaminated soil, which would then be placed in the land treatment cell. The DRU was dismantled due to an inability to meet regulatory requirements.

The RCRA leaded tank bottom area was closed during April 1988 . About 600 cubic yards of contaminated soil were removed and

taken to the Peoria Disposal Landfill. This area is now well-vegetated.

Groundwater has been monitored since the 1970's. A RCRA quarterly monitoring program began in 1981. In addition, Amoco is conducting a liquid hydrocarbon monitoring and recovery program with eight recovery wells removing hydrocarbons from the groundwater. An interceptor trench, located along the western property boundary, is also used to collect groundwater containing dissolved petroleum products.

Amoco Oil Company has dismantled a majority of the facility that is not regulated by RCRA. The site continues to be addressed under RCRA corrective action. Amoco was issued a consent order to conduct a RCRA Facility Investigation (RFI) to address and characterize the entire site. The RFI was submitted in December 1995. Regulatory review of the RFI was completed in April 1998 and comments were submitted to Amoco. In 2000, the site was divided into sections for Corrective Action purposes in order to speed progress. Amoco began an enhanced fluid recovery system to capture free-phase hydrocarbons on- and off-site. Off site, Amoco has also begun installation of a horizontal recovery well system to remediate the entire off-site Norledge Area.

General Geologic and Hydrologic Setting:

The site is near the junction of Sugar Creek and the Missouri River. The plant is located on an upland, while the disposal facilities are located in the floodplain.

Pennsylvanian-age limestone and shale bedrock is present in the upland area south of the river. Most of this area is covered by varying thicknesses of silty clay loess and weathered loess. The disposal facilities for the plant are situated on fill and alluvial soil of the Missouri River floodplain.

The bedrock underlying surficial material is considered to be of low permeability. Movement of contaminants is therefore most likely to occur through highly permeable alluvium in the valley and, to a lesser extent, through the loess.

Potential contaminants from the uplands are expected to move downgradient to the north, emerging at the flood plain. Contamination from the floodplain may move through the shallow alluvial material directly to the Missouri River.

Public Drinking Water Advisory:

Alluvial groundwater in the immediate vicinity is potentially usable as a drinking water supply, but there is no current use nearer than the alluvial wells serving the city of Independence located 2.5 miles downstream. The nearest public water system surface water intake is at Lexington, 31 miles downstream. The site may affect the water quality of the Missouri River, but poses little direct threat to downstream public water systems.

Health Assessment:

Lead attacks the central nervous system, kidneys, blood, GI tract and gingival tissue. Phenol attacks the liver, kidneys and skin. Tetraethyl lead attacks the central nervous system, cardiovascular system, kidneys and eyes. Chromium compounds vary widely in toxicity. Hexavalent chromium, which has been found at the site, attacks the blood, liver, kidneys, respiratory system, eyes and skin. Mercury attacks the central nervous system, kidneys, respiratory tract, skin and gingival tissue. Toluene is a central nervous system depressant. Hexavalent chromium, arsenic

and benzene are all proven human carcinogens.

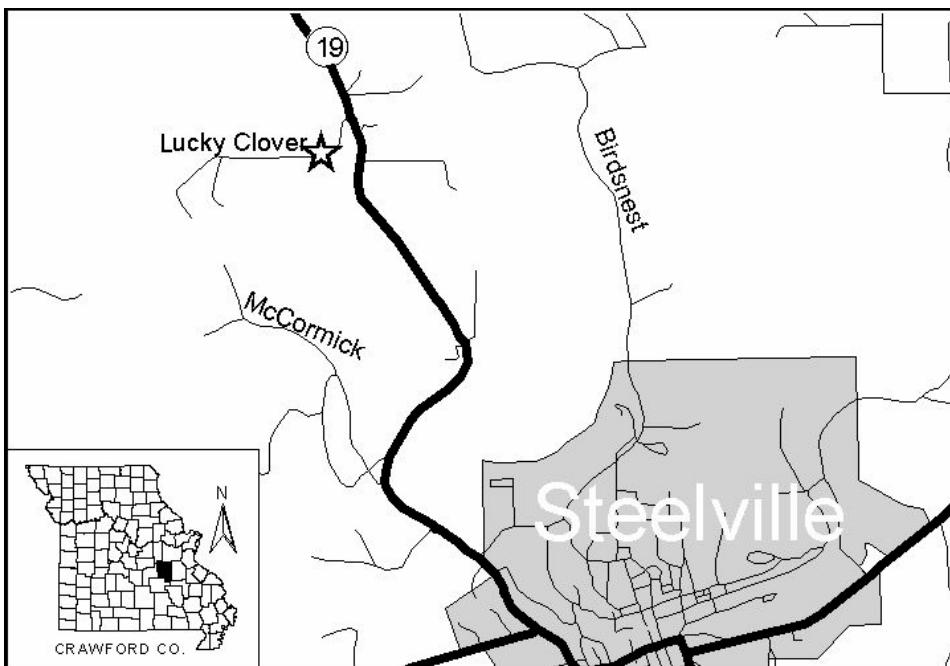
Contaminated groundwater is the major pathway of concern at this site. The average slope is less than 2 percent, which makes surface runoff unlikely except when the Missouri River floods the area. Direct contact and inhalation are not considered to pose a public health threat since the facility is isolated and access is restricted. There is an off-site groundwater plume off the upland portion of the facility; this release, however, is not believed to be associated with the Registry portion of the facility.

An exposure assessment conducted by the Missouri Department of Health uncovered no evidence of human exposure occurring off site. The nearest public drinking water wells are about 2.5 miles downstream. The water quality of both the Missouri River and the alluvial aquifer could be adversely affected by the site.

Based on available information, the site poses a health risk. This determination is based on the toxicity of the chemicals present and the known groundwater contamination.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Arneson Timber



Site Name: Arneson Timber

Classification: Class 3

Date of Placement: July 1, 1999

Address: Lucky Clover Road, Crawford County, Missouri, NE ¼, SE ¼, Sec.20, T.38N, R.4W, Indian Springs Quadrangle

Present Property Owner: Charles Leezy

Lead Agency: EPA

Waste Type: Pentachlorophenol, 2,3,7,8-TCDD (dioxin), and dioxin equivalents

Quantity: Not determined

Site Description:

The Arneson Timber Site is located about 3 miles north of Steelville in rural Crawford County. The site is fenced and warning signs are posted. The site covers about 1 acre within a larger parcel of property consisting of approximately 100 acres.

The site was the location of a lumber mill and wood-treating facility from 1972 until 1983. Arneson Timber Company, the lessee,

operated the facility. In 1983, the operation moved to another location. While closing the site, Arneson Timber Company personnel cut open a 9,000-gallon storage tank containing an unknown amount of spent pentachlorophenol (PCP) wood preservative solution. This solution or sludge was placed in an unlined containment basin. The hole left in the ground by the tank was also partially filled with sludge, and subsequently drained to the basin.

After an inspection of the site, the Missouri Department of Natural Resources directed the Arneson Timber Company to perform a cleanup. Eleven 55-gallon drums of visibly contaminated soil were removed from the basin. The hole and the basin were then filled with soil from a berm that had supported a track used to transfer treated lumber from the pressure tank to the drip pad. The soil from the berm was contaminated with PCP that had dripped off the freshly treated lumber.

Environmental Problems and Areas of Concern Related to Site:

Samples collected in December 1983 and February 1987 documented the presence of PCP in soil at concentrations of up to 9,000 parts per million (ppm) at depths ranging from

4 to 6 feet. PCP was detected in surface soil at levels as high as 1,700 ppm.

In December 1983, PCP was detected in the on-site well, located about 150 feet from the basin area, at 2 parts per billion (ppb). The U.S. Environmental Protection Agency's (EPA) drinking water standard, the Maximum Contaminant Level, is 1 ppb. While subsequent sampling did not detect PCP in the on-site well or in five nearby wells, groundwater contamination remains a concern. The site is situated in a karst area. Migration of PCP from the site was documented in February 1987, at 2 and 5 ppm in sediment samples from two downgradient drainage ditches. Dioxin (2,3,7,8-TCDD) was also present at concentrations ranging from 0.8 to 2 ppb.

The Meramec River is 1,500 feet downgradient of the site. An ongoing threat of releases and migration of hazardous substances is posed by potential weather conditions, particularly heavy precipitation events that may wash contaminated soil and sediments into a drainage leading off site. During the dry summer months, contaminants potentially could be spread by wind.

Remedial Actions at Site:

EPA sampling events in December 1990 and spring 1991 culminated in a Removal Assessment Report, finalized on October 17, 1991. PCP was detected in soil at concentrations ranging from 4.4 to 710 ppm at depths from 0 to 9 feet. In addition, dioxin was detected in six samples at levels ranging from 0.01 to 1.6 ppb. Dioxin equivalents were detected at concentrations ranging from 1 to 10 ppb.

The EPA conducted additional sampling in 1996 in order to delineate the area of greatest contamination. The results indicated that an area about 300 by 150 feet was contaminated with PCP at concentrations above 5 ppm at depths from 0 to 4 feet.

In February 1999, the EPA, Arneson Timber Company, and the site owner entered into an Administrative Order on Consent (AOC) to conduct cleanup actions. The AOC requires that Arneson Timber Company submit a work

plan for approval, fence the area of contamination, and establish institutional controls. The fence is complete and warning signs have been posted.

Due to new Land Disposal Restriction requirements, off-site disposal will no longer be included in the removal action. A new removal work plan proposed development of a 35,000-square-foot landfarm unit for bioremediation of the remaining PCP.

The on-site concrete drip pad was broken up in March 2000. The top layer was stockpiled on site. The pad appeared to be poured on top of an older concrete pad and gravel fill. Visible contamination was not present, and surface residue samples confirmed PCP was not present at detectable levels.

The EPA approved the plan for the construction phase, but will be addressing the operation, maintenance and monitoring issues at the post-construction inspection. The Responsible Parties likely will need to operate and maintain the treatment cell through at least five biannual sampling events to collect enough data on which to determine if the requirements in the AOC are met.

The construction of a one-acre bio-remediation landfarm unit was completed in September 2000. All of the contaminated soil has been consolidated into this area. Clay mixed with bentonite was compacted in the trench area before contaminated soil was placed on top of it to provide a liner for the landfarm unit. Two impoundments were constructed to prevent off-site migration of any runoff from the site. An Underground Injection permit was issued by the department's Water Pollution Control Program on August 11, 2000, with a discharge limit for PCP of 15 ppb. A treatment system is planned for overflow impoundment water containing concentrations of PCP exceeding the 15 ppb discharge limit.

On January 15, 2001, the south pond overtopped and some of the water discharged to the county roadway. The local fire chief reported that 300 gallons spilled onto the county road before the gap in the berm was plugged. A contractor for the Responsible Party performed corrective actions. These measures included breach repair, dam

fortification, installation of straw and clay ditch checks, installation of small terraces to slow water flow, and construction of a new temporary impoundment. Site inspections are now being conducted twice weekly.

Tilling and monitoring of the contaminated soils in the treatment cell continues. Sampling results from July and September 2001 indicate that treatment objectives have been achieved. The EPA has decided that three bi-annual consecutive sampling events have to show pentachlorophenol levels below 9.1 ppm. The EPA can then determine if the bioremediation has reduced contamination below the EPA's "any use" levels and bioremediation may cease. Sampling was conducted again on May 30, 2002.

General Geologic and Hydrologic Setting:

The site, located within the Salem Plateau portion of the Ozark Plateau physiographic province, is situated on a ridge with a steep southern slope and a gentle northern slope. The heads of two small valleys are located on site; one valley drains to the south, and the other drains to the west-northwest. The site is located 1,800 feet north of and 160 feet higher in elevation than the Meramec River. A gravel pit exists on the river flood plain immediately south of the site.

The site is underlain by Gasconade Dolomite bedrock, which is covered by unconsolidated materials consisting of a thin layer of loess underlain by residuum derived from weathering of the Roubidoux Formation and Gasconade Dolomite. Sinkholes are present in close proximity to the site, indicating karst (dolomitic dissolution) in the cherty dolomite bedrock.

The Ordovician-age Gasconade Dolomite is part of the Ozark Aquifer, which is the principal aquifer of the Salem Plateau region. The water table ranges from 9 to 70 feet below ground surface. Groundwater most

likely flows to the south toward the Meramec River. Groundwater possibly flows along solution-enlarged fractures beneath the site.

Public Drinking Water Advisory:

The nearest source of public drinking water is a well serving the Cobblestone Lodge 0.6 miles southeast of the site. Contamination from the site has not affected this water supply. However, precaution should be taken to prevent contaminating the regional aquifer, which is a potential drinking water resource.

Health Assessment:

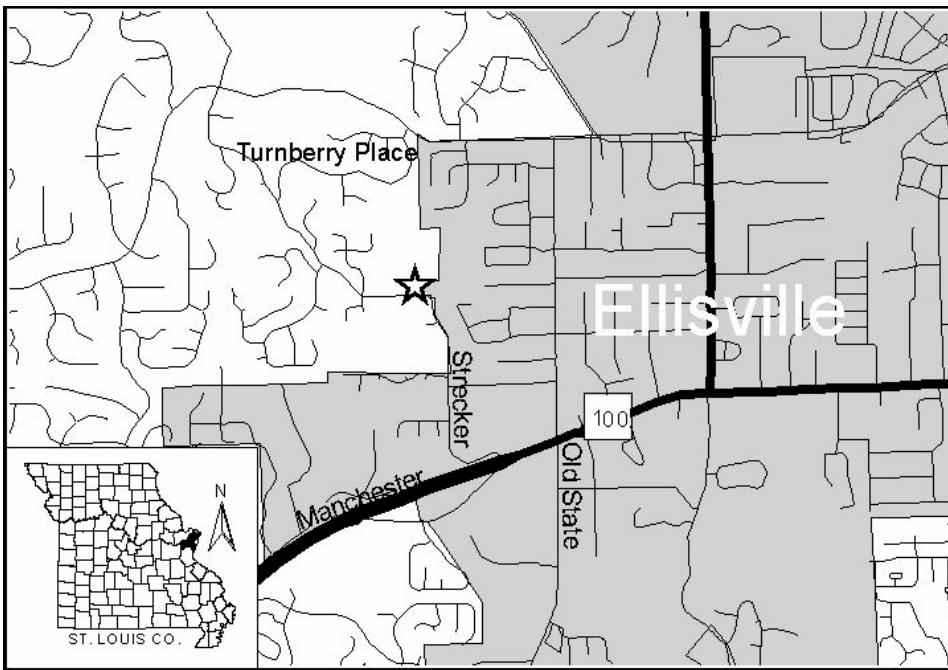
PCP can harm the liver, kidneys, blood, lungs, nervous system, immune system and gastrointestinal tract. Dioxin is one of the most toxic substances known, however, its toxicity varies greatly between species. Animal studies have shown that dioxin produces acnegenic, fetotoxic, teratogenic, mutagenic, carcinogenic and immunogenic effects. In humans, it is known to have an acnegenic effect (chloracne). It is also suspected to cause soft tissue sarcoma, non-Hodgkin's lymphoma, Hodgkin's disease and porphyria cutanea tarda.

Possible exposure routes to dioxin at this site include any or all of the following: ingestion of contaminated soil, inhalation of contaminated dust, or dermal contact with contaminated soil or dust. Thus, any future soil disturbance could provide a route for human exposure. In addition, there is evidence of off-site contamination.

Based on available information, a health threat exists at this site.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Bliss Property at the Ellisville Area



Site Name: Bliss Property – Ellisville
(includes the former Simmons property)

Classification: Class 3

Date of Placement: January 3, 1984

Address: 149 Strecker Road, Ellisville, St. Louis County, Missouri, Portions of SW 1/4, NW 1/4, Sec. 32, T. 45N, R. 4E, Manchester Quadrangle

Present Property Owner: Jerry Russell Bliss and Russell Bliss

Lead Agency: EPA

Waste Type: 2,3,7,8-TCDD (dioxin), waste pigments, solvents, oils, and pesticides

Contaminants: Di-n-butyl phthalate, bis (2-ethylhexyl) phthalate, naphthalene, isophorone, chloroform, ethyl benzene, tetrachloroethylene, toluene, benzene compounds, polychlorinated biphenyls, dioxin

Quantity: EPA estimates at least 1,500 drums, 7,000 cubic yards of dioxin-contaminated soils, and 10,000 cubic yards of non-dioxin hazardous waste materials and soils.

Site Description:

This property consists of about 16.5 acres in western St. Louis County located on the north side of Strecker Road. The Bliss property and parts of several contiguous properties were addressed as the entire "Bliss - Ellisville Site." The Bliss property is currently used as a personal residence, a rental residence, and a commercial horse boarding and arena operation. The site is located in an upland wooded area. The surrounding area is primarily residential and growing rapidly. The site is in the middle of numerous new housing developments, with residences within 2,000 feet of formerly contaminated areas. A preschool and a home for the aged are located within 0.5 miles. Quail Woods Park is also located nearby.

During the 1960's and 1970's, Bliss Waste Oil Company operated this site. The business engaged in transportation, disposal and recycling of waste oil products, industrial wastes and chemicals.

Investigations identified soil contamination resulting from the disposal of dioxin-contaminated waste, in conjunction with the waste oil hauling business. Investigations also revealed that other hazardous wastes,

such as solvents, pesticides and oils, were disposed in bulk quantities at the site. The site was added to the EPA's National Priorities List in 1983.

In December 1998, Jerry Bliss purchased a 4.29 acre property owned by Martha Simmons that was also part of the Ellisville-Bliss Site and contiguous to the property already owned by Mr. Bliss.

Environmental Problems and Areas of Concern Related to Site:

Groundwater may be contaminated from previous site operations. Groundwater contamination could potentially affect the local groundwater aquifer, as well as surface water through area springs.

Remedial Actions at Site:

In June 1981, the Missouri Department of Natural Resources excavated exploratory trenches on the property to confirm the reported presence of hazardous material in drums and disposal pits. The department conducted a geophysical survey of the property in June 1982. A remedial field investigation was performed between December 1982 and February 1983. The investigation delineated the approximate boundaries of actual or suspected waste disposal locations.

In February 1986, a feasibility study was completed, evaluating various cleanup alternatives. A public comment period followed. In April 1986, 400 feet of fence was erected by the department to prevent access to the site from the newly-developed Quail Woods Park. A Record of Decision (ROD) for the management of the non-dioxin contaminated soils was signed in September 1986. The ROD proposed excavation and off-site disposal as the preferred remedy for the buried drums and buried waste.

In December 1990, the Eastern District of the Federal District Court approved a Consent Decree signed by the EPA, Syntex Agribusiness Inc., the U.S. Justice Department, and the department for a mixed-work settlement that permanently removed the dioxin-contaminated material.

Under the terms of the Consent Decree, contaminated material exceeding health-based levels was excavated and transported to Times Beach for thermal treatment. The site was then restored.

Also during 1990, the EPA investigated this property and the contiguous properties to determine the aerial extent of dioxin contamination. The study determined that 180,000 square feet was contaminated. At the completion of the sampling, the site was surveyed and a security fence was constructed around the perimeter to control access to the dioxin-contaminated areas. The 6-foot fence, completed in August 1990, was constructed of chain link fabric with three barbed wire strands on top.

In July 1991, the EPA completed a feasibility study evaluating several remedial alternatives for the final management of the dioxin-contaminated soils. The EPA's preferred remedy included excavation and transportation to Times Beach for thermal destruction. In July 1992, the EPA developed a plan to monitor groundwater at this site.

In November 1993, the EPA collected surface soil samples downgradient of the site within the Turnberry Place Subdivision. This sampling was performed to see if recent flooding had caused any migration of dioxin-contaminated materials off site. No dioxin was detected in any of these samples.

The site cleanup by the EPA took place between February 7 and August 26, 1996. The dioxin-contaminated materials were removed to a 1 part per billion (ppb) equivalent level. About 24,707 tons of dioxin-contaminated waste was excavated and delivered to the Times Beach Thermal Treatment Facility. About 576 tons of dioxin-contaminated soil, mixed with paint wastes (and 210 drums containing same), were excavated and delivered to the APTUS incinerator in Coffeyville, Kansas. Eighty-one drums of waste not contaminated with dioxin were sent to Environmental Services of America in Scott City. Forty-nine drums containing listed hazardous wastes D001, D005, D007, D008, D019, D035, and D040, as well as 169 tons of paint waste-contaminated soil, were delivered to Rollins

Environmental Services in Deer Park, Texas. Also, 581 tons of paint waste-contaminated soil was delivered to Liquid Waste Disposal in Calvert City, Kentucky.

Groundwater monitoring wells were installed by the EPA in the fall of 1997. Two wells were placed downgradient and one upgradient. These wells will determine if any of the contaminants migrated into the local groundwater. The wells have been sampled quarterly beginning in late 1998. A spring, located about 2.5 miles from the site, has also been sampled to determine if any possible contamination has migrated from the site.

General Geologic and Hydrologic Setting:

The site is located in an upland, wooded area with steep hillslopes descending to a low-lying, intermittent tributary of Caulks Creek.

The upland soils are composed of silty clay loess overlying cherty residuum derived from the weathering of bedrock. The loess is up to 10 feet thick and has moderate to low permeability. The residuum is moderately to highly permeable. Soil material along the valley, near the horse arena, is composed of gray, silty clay and clayey silt.

Bedrock at the site consists of the Mississippian-age Burlington Limestone Formation. This formation contains solution-enlarged openings which provide avenues of rapid fluid transport to groundwater.

Under normal flow conditions, the surface drainage upstream of the former dump site area is gaining; that is, water flowing on the surface tends to remain on the surface. This is due to the presence of the relatively low-permeability loess soil which underlies that portion of the property. However, in the vicinity of the former dump site where the loess is absent, surface water is lost to the subsurface via the relatively high-permeability cherty residuum and weathered bedrock present beneath that portion of the site. Water tracing studies conducted in 1992 and 1997 indicate that water flowing into the subsurface in the vicinity of the former dump site is discharged at Lewis Spring, which is located along Caulks Creek downstream of

the site. During high surface flow conditions, such as that immediately following heavy precipitation events, some flow remains in the surface stream throughout its extent on site and further downstream.

Due to the presence of losing stream conditions immediately downgradient of the former dump site, groundwater quality may be adversely impacted. Private wells open to the shallow aquifer could possibly be affected. However, subsurface flow from the losing stream segment is probably sufficiently channelized to prevent widespread contamination of groundwater.

Public Drinking Water Advisory:

The nearest public well is 2 miles southwest of the site. No public wells are currently affected by this site. However, the local groundwater is potable and new wells are commonly being constructed in this area to support local development.

Health Assessment:

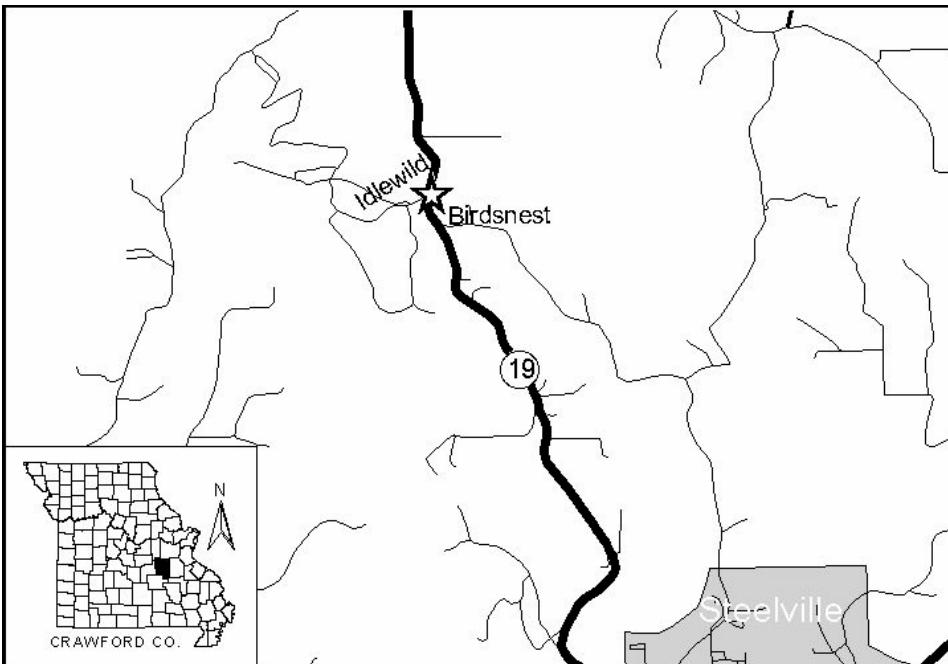
The dioxin-contaminated soil, the buried drums, and associated soil contamination have all been removed. Therefore, the route of potential exposure that remains is through groundwater.

The Missouri Department of Health and Senior Services (DHSS) has sampled private wells downgradient from the site since 1984. Sampling has not revealed any off-site migration of contaminants via groundwater. Analysis of Lewis Spring, also downgradient from the site, indicates possible low-level solvent and chlorination byproduct contamination.

This site has been remediated by the EPA. A groundwater study is underway to determine if any risk to public health can be expected to occur from residual contamination through that route.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Burlington Northern-Crider Property



Site Name: Burlington Northern Railroad-Crider Property

Classification: Class 3

Date of Placement: September 26, 1996

Address: Hwy. 19 & Idlewild Road, Steelville, Crawford County, Missouri, SE 1/4, NW 1/4, Sec. 17, T. 38N, R. 4W

Present Property Owner: Burlington Northern-Santa Fe Railway Company

Lead Agency: DNR

Waste Type: Heavy metals (lead)

Quantity: Not determined

Site Description:

This site is located on the east side of the road at the intersection of Highway 19 and Broken Arrow Road, 3.5 miles south of Cuba. It occupies about four acres in a rural residential area. The property was contaminated by the disposal of railcar debris containing lead ore waste, which contained lead levels that exceeded health-based screening levels and contained unacceptable concentrations of leachable lead.

Environmental Problems and Areas of Concern Related to Site:

Surface water and groundwater contamination may be potential problems. Material very high in total lead concentration is on the surface and in the crevices of exposed bedrock.

Remedial Actions at Site:

Due to Resource Conservation and Recovery Act enforcement action, cleanup of this site was completed in 1997. Using the MAECTITE® process, lead and other heavy metals in the soil were stabilized in a non-leachable form. Stabilized soil then was removed to an acceptable landfill. Remediation also included demolition and removal of the Crider residence and out-buildings. The property was graded and seeded. Vegetation is becoming established, but bare, eroded areas are still evident.

In December 1998, the U.S. Justice Department and Burlington Northern Santa Fe Railway (BNSF) concluded a settlement of outstanding alleged criminal violations of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and the Clean Water Act (CWA), stemming from former railcar cleaning operations.

BNSF pled guilty to one violation of CERCLA for failure to notify of a release of a regulated quantity of a hazardous material, and one violation of the CWA for discharging a pollutant into U.S. waters without a permit. The company was fined \$7 million, payable to the United States. Restitution of \$3 million was made to the state, which includes: \$1 million to the Natural Resources Protection Fund, \$1,250,000 to the Hazardous Waste Remedial Fund, \$250,000 to the Hazardous Waste Fund, \$300,000 to the Department of Health and Senior Services (DHSS) for lead abatement programs, and \$200,000 to the Missouri State Highway Patrol.

On April 28, 1999, a civil Consent Judgment was entered in Crawford County Circuit Court by the Missouri Department of Natural Resources and BNSF. The company paid a \$900,000 civil penalty to the Crawford County School Fund and \$500,000 restitution for natural resource damages. The Consent Judgment required that the company locate any additional sites; conduct initial site characterization, removal action, and risk assessment; and develop and implement a Final Remedy.

BNSF submitted a Final Remediation Activities Summary Report in February 2002. The leachable lead in the soil on the surface or in the crevices of the bedrock was stabilized using the MAECTITE® process. BNSF estimates that one to two cubic yards of treated soil remain on the rough surface of the exposed bedrock. Confirmation samples collected after the treatment process indicate that the leachable lead and cadmium in the soil was successfully stabilized. However, high concentrations of total lead, up to 42,000 parts per million, remain. Based on these activities, no further actions at this site will be required under the Consent Judgment.

General Geologic and Hydrologic Setting:

The site is located in an upland setting, with steeply-incised stream valleys that are tributaries of the Meramec River. Surficial materials of the area are composed of residuum derived from local bedrock. The residuum has moderate to high permeability and consists of 30 to 70 feet of gravelly, sandy clay interbedded with sandstone boulders.

Class 3 Sites

Bedrock consists of chert, sandstone and dolomite of the Ordovician-age Roubidoux Formation. The Roubidoux Formation and the underlying Gasconade Dolomite have been subjected to subsurface solutional weathering, which created karst features in the form of sinkholes, losing streams, caves and springs. Sinkholes and losing streams are groundwater recharge features. Due to the highly fractured and weathered nature of the Roubidoux Formation and the Gasconade Dolomite, both have high permeability.

Locally, water is extracted from the bedrock aquifer to supply individual residents. Wells in the area typically range from 200 to 250 feet deep and produce water from the lower Gasconade Dolomite, although they may also produce from the Roubidoux Formation. The karst nature of the formations that compose the aquifer make it highly susceptible to contamination from surface water sources. Shallow groundwater flow direction may reflect surface topography; however, in karst areas, this is not necessarily the case.

Public Drinking Water Advisory:

The nearest source of public drinking water is a well serving Birds Nest Lodge 1.5 miles southeast of the site. Contamination from the site has not affected this water supply. However, precaution should be taken to prevent contaminating the regional aquifer, which is a potential drinking water resource.

Health Assessment:

The exposure to lead contamination resulted in elevated blood-lead levels in the former residents, the Crider family, who were evacuated prior to site stabilization. Remediation has addressed the major routes of concern. Currently, the site is fenced, a warning sign is posted, and the property is uninhabited.

Based on available information, the Crider property is not a current health threat.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Chillicothe FMGP



Site Name: Chillicothe FMGP

Classification: Class 3

Date of Placement: April 8, 2000

Address: Between Calhoun and Bridge Streets, Chillicothe, Livingston County, Missouri, NW ¼, NW ¼, SE ¼, Sec. 36, T. 58N, R. 24W.

Present Property Owner: Aquila, Inc.

Lead Agency: DNR

Waste Type: Coal tar, which contains volatile organic compounds (VOCs) and semi-volatile organic compounds, including polycyclic aromatic hydrocarbons (PAHs)

Quantity: Not determined

Site Description:

The Chillicothe Former Manufactured Gas Plant (FMGP) Site is 0.63 acres in size and located in an industrial area next to residential areas within the city of Chillicothe. A manufactured gas plant operated at the site from 1892 until 1939. Remnants of foundations from former gas plant structures

are present. Some structures from the past gas manufacturing facility might still be partially intact beneath the site. A chain-link fence topped with barbed wire has been installed around the site. The site is currently used as a service center for electric operations in the Chillicothe area. It contains a metal warehouse used as an office and for storage of parts and equipment. The rest of the site is mostly a storage yard. Most of the surface is covered with gravel.

The plant first produced oil gas, then changed to water gas in 1913. After the plant stopped manufacturing gas, liquefied petroleum gas was stored at the site for distribution to the city. Estimated total production during the plant's 47 years of operation is 324,000,000 cubic feet of gas and 270,000 gallons of coal tar. Coal tar, a byproduct of the gas manufacturing process, is the primary waste of concern.

Environmental Problems and Areas of Concern Related to the Site:

Carcinogenic PAHs are present at concentrations above health-based screening levels in the surface soil and in three residential yards adjacent to the site. Coal tar containing PAHs and VOCs has been

detected at concentrations above regulatory limits in the subsurface on site. Specifically, benzene was present at a concentration above the Toxicity Characteristic Leaching Procedure (TCLP) regulatory limit of 0.5 parts per million (ppm). One sample had a TCLP result of 7.8 ppm.

Water collected from the water supply line to the on-site warehouse contained low levels of ethylbenzene and xylene. The source of this contamination has not been determined.

Remedial Actions at Site:

The department completed an Integrated Site Inspection/Removal Site Evaluation (SI/RSE) on March 26, 1999. The SI/RSE concluded that the surface soil contamination is not a concern at this time. The coal tar remaining in the subsurface currently does not pose an exposure risk; however, it will continue to be a threat should excavation occur in the future. Two volatile organic compounds were detected at low levels in the drinking water. The SI/RSE recommended that the site owners conduct supplemental sampling to confirm the presence of these contaminants and investigate their possible source.

General Geologic and Hydrologic Setting:

The Chillicothe FMGP Site is located in the Dissected Till Plains region of the Central Lowlands Physiographic Province. The area is blanketed by a layer of low-permeability glacial till, consisting of a poorly sorted mixture of clay to boulder-sized particles. A thin mantle of windblown loess covers the till. The thickness of unconsolidated deposits ranges from 0 to 180 feet in the area.

Pennsylvanian-aged bedrock, consisting of shale, limestone and sandstone, underlies the unconsolidated material.

An east-west trending preglacial channel located just south of Chillicothe is the primary source of drinking water in the area. Minor amounts of poor quality groundwater can be found in glaciofluvial sand and gravel lenses in the till. Yields from wells outside the preglacial channel are generally low. Wells located in the preglacial channel can have substantial yields.

Water from the consolidated bedrock is mineralized; which increases with depth. It appears that in the early part of the century, the bedrock was commonly used as a source of groundwater, but all recent wells draw water from the unconsolidated sediments.

Public Drinking Water Advisory:

The Chillicothe FMGP is located within 2 to 3 miles of four wells serving the city of Chillicothe and two wells serving Livingston County Public Water Supply District #2. Groundwater contaminants at the site are a concern, but have not been shown to be moving toward the wells or been detected in the drinking water.

Health Assessment:

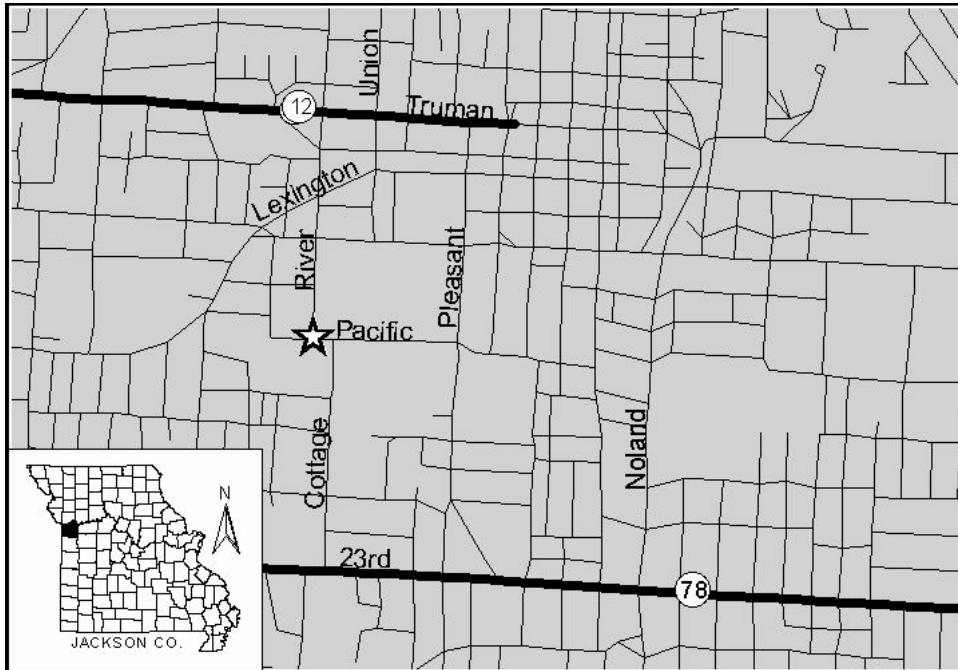
Benzene is a known human carcinogen. Ethyl benzene attacks the liver and kidneys. It may also contribute to respiratory and skin disease. Cadmium has negative effects on the respiratory system. Toluene can cause dryness of the skin and negative effects on the central nervous system. Xylene contributes to central nervous system depression, liver and kidney damage and lung congestion. Seven PAHs are considered to be carcinogenic.

The major pathway of concern to nearby residents is contaminated surface and subsurface soil. Primarily, suspected areas of contamination are located at below grade structures such as the underground naptha tank, tar separating tanks, and underground oil storage tanks. Groundwater could become contaminated. Underground piping at the site could contain limited quantities of tars. Low levels of two PAHs have been found in the on-site water supply.

The site represents a potential health threat. Although the majority of Chillicothe's residents rely on water from the municipal supply, seven private wells are used within 4 miles. These wells could become contaminated.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Independence FMGP #1



Site Name: Independence FMGP #1

Classification: Class 3

Date of Placement: November 28, 2000

Address: Northwest of the intersection of West Pacific Avenue and South River Boulevard, Independence, Jackson County, Missouri

Present Property Owner: Reorganized Church of Jesus Christ of Latter Day Saints (RLDS)

Lead Agency: DNR

Waste Type: Coal tar, which contains volatile organic compounds (VOCs) and semi-volatile organic compounds, including polycyclic aromatic hydrocarbons (PAHs)

Quantity: Not determined

Site Description:

The Independence Former Manufactured Gas Plant (FMGP) #1 Site is located in a combination residential, commercial and light industrial area. A comparison of historic Sanborn Fire Insurance maps to present day conditions indicates that the gas plant

operations occurred on property currently owned by RLDS. In addition, several of the plant operations buildings were located beneath what is now West Pacific Avenue. The site is located within the drainage basin along the southeast edge of the RLDS Auditorium parking area and extends beneath West Pacific Avenue. Currently, the entire basin area is covered by healthy vegetation and access is not restricted. No visual remains of the former gas plant structures are present.

The FMGP structures associated with the Coal Gas Works (later called the Jackson County Light, Heat, and Power Co. Gas Works) appear on historic Sanborn maps as early as 1885 and as late as 1898.

The structures depicted included three gas holders, retort houses and purifiers. No information is available regarding the operations on site after the closing of the manufactured gas plant circa 1926 and prior to the construction of the drainage basin in the early 1990's by RLDS.

Environmental Problems and Areas of Concern Related to Site:

Subsurface soil samples collected from the approximate former location of the FMGP

contained VOCs and carcinogenic PAHs at concentrations exceeding health-based screening levels. One sample contained leachable benzene that exceeded the Toxicity Characteristic Leaching Procedure regulatory limit of 0.5 parts per million, making this sample characteristic hazardous waste based on toxicity. The coal tar remaining in the subsurface may pose human health risks should any excavation or accidental uncovering occur in the future.

Remedial Action at the Site:

The HWP completed a pre-Comprehensive Environmental Response, Compensation and Liability Information System (CERCLIS) Site Screening report in May 2000. Coal tar, a byproduct of the gas manufacturing process, is the primary waste of concern on site.

The Site Screening report concluded that the majority of contamination is located between 6 to 7 feet below ground surface and is not expected to pose a significant air or soil exposure risk. No residents or workers are on site. Although access is not restricted, visitation to the site is unlikely because of a large drainage basin and paved street that now occupy the former gas plant operations properties. Although hazardous substances are present, the potential for exposure and migration off site is minimal. Further Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) action was not recommended at the time of the site screening, provided that institutional controls are in place and state oversight of future activities at the site is ensured.

General Geologic and Hydrologic Setting:

The site is located on the rolling, loess-covered hills immediately south of the Missouri River in the Kansas City region. It lies outside of a 50-year flood plain. Loess-derived surface soils at the site are composed of silt loam to silty-clay with a moderate permeability. Roughly 5 to 24 feet of loess and glacial till overlie the local bedrock.

Kansas City Group Pennsylvanian-age bedrock at the site consists of 450 feet of 1- to 20-foot thick beds of alternating limestone and shale with infrequent thin coal beds. Surface water infiltrates the shallow limestone layers which, in turn, form small intermittent springs on the hills.

Deep groundwater in the Kansas City region is rarely used for drinking purposes due to high mineral content. In close proximity to the site, groundwater is encountered at depths of 24 to 55 feet below the surface.

Public Drinking Water Advisory:

The city of Independence's wells are located in the Missouri River alluvium 5 miles northeast of the site. No other public water sources are in the area, and none are expected to be affected by this site.

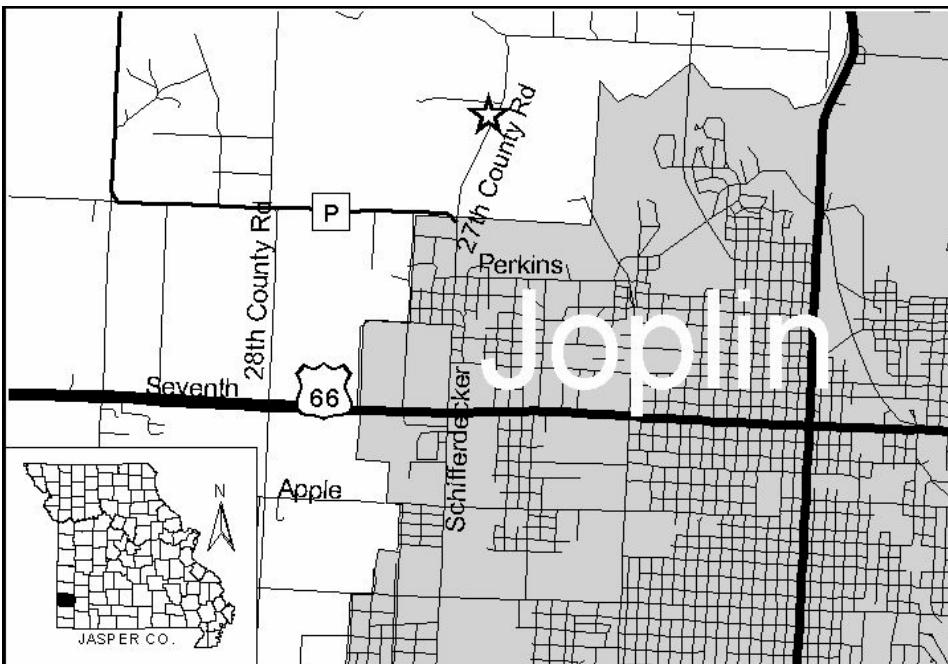
Health Assessment:

Substances such as coal tar contain carcinogenic hazardous substances that can pose a threat to human health. Some PAHs are animal carcinogens and suspected human carcinogens. Benzene is a known human and animal carcinogen and a suspected teratogen.

Although coal tar residuals are present in surface and subsurface soil at the Independence FMGP #1 site, the majority of contamination is located between 6 to 7 feet below the ground and is not expected to pose a significant air or soil exposure risk. There are no residents or workers on the site. The potential for exposure and migration off site is minimal. Disturbance of the soil, other than regular lawn care and parking lot maintenance, would increase the chance for public exposure to the buried hazardous wastes.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Joplin Oil Ponds



Site Name: Joplin Oil Ponds

Classification: Class 3

Date of Placement: June 14, 1984

Address: Joplin, Jasper County, Missouri, SW 1/4, NW 1/4, Sec. 33, T. 28N, R. 33W, Joplin West Quadrangle

Present Property Owner: City of Joplin

Lead Agency: DNR

Waste Type: Barium, chromium, lead, dichloroethane, trichloroethane, p-chloro-m-cresol, pentachlorophenol, and semi-volatile organic compounds

Quantity: Estimated at 3,000 cubic yards of sludge and contaminated soil

Site Description:

The site consists of two lagoons where a variety of wastes were dumped by septic tank haulers. The 30-year-old lagoons were once filled with sludge and water; however, the lagoons are now almost completely cleaned out.

Environmental Problems and Areas of Concern Related to Site:

Public and private water supply wells in the immediate area may be affected due to the geology of the area.

Remedial Actions at Site:

Based on comprehensive sampling of the water, sludge and soil at the site and the surrounding area in June 1987, Joplin prepared a remedial action plan. After modification, the plan was approved by the Missouri Department of Natural Resources .

Work to clean up the site began in November 1988. The water in the ponds was removed and, after treatment, discharged to the sewer system leading to the city's wastewater treatment plant. The sludge was then stabilized with fly ash and mixed to partly dry it. The city's remedial contractor took the treated sludge to the Peoria Disposal Services Inc. facility in Peoria, Illinois.

Removal of material continued into February 1989. The contaminated soil in the lagoons' bottoms and sides was included in the removal operations. After the removal was done, several rounds of sampling were begun

to determine if the site had been cleaned up to meet the Missouri Department of Health and Senior Services' (DHSS) health-based standards for the three heavy metals that were the critical contaminants at the site: barium, chromium, and lead.

Monitoring showed that some residual contamination remained. Lead is the only parameter still exceeding applicable standards. The city did several additional removals of material from the ponds; yet, in places, the lead level still exceeds standards. Sampling of residual water in the ponds and groundwater in the vicinity showed that the site is not causing water pollution problems.

General Geologic and Hydrologic Setting:

Residual soils that have developed from Mississippian-age limestone are present at the site. The residuum contains a high percentage of stone in a clay matrix. Permeability of the material is high. Residuum thickness in the vicinity of the lagoons is estimated to be 10 feet; however, the area has been reworked, and some of the soil may have been removed.

Below the soil is a cherty, Mississippian-age limestone, which extends 80 to 120 feet below the surface. This limestone has undergone extensive weathering, producing subsurface cavities that provide avenues for water movement. Mining ores are present at a depth of about 80 feet. Room and pillar mining methods have been used to remove the ore. Consequently, numerous mine shafts occur on and around the property, and extensively-mined areas occur beneath the site. Large voids created by the mining activities are now filled with water, and large chat piles are present along the eastern and southern property lines. Potential for catastrophic collapse exists at the site, due to both the nature of the underlying bedrock and subsidence from the mining activity.

Two aquifers exist in the area: a shallow aquifer consisting of Mississippian-age limestone at the zone of mineralization and a deep aquifer consisting of Cambro-Ordovician sandstone, dolomite and chert, located well below the ore-bearing strata. Surface and shallow groundwater movement in the area of

the lagoons is generally to the east toward Leadville Hollow, and to the north toward Turkey Creek, a gaining stream. Due to the permeable nature of the soil and bedrock material, shallow groundwater is anticipated to be adversely affected by the site.

Public Drinking Water Advisory:

Numerous public water systems surround this site, but none of them should be affected by this site. The nearest well is 2.25 miles away and all are cased to at least 400 feet.

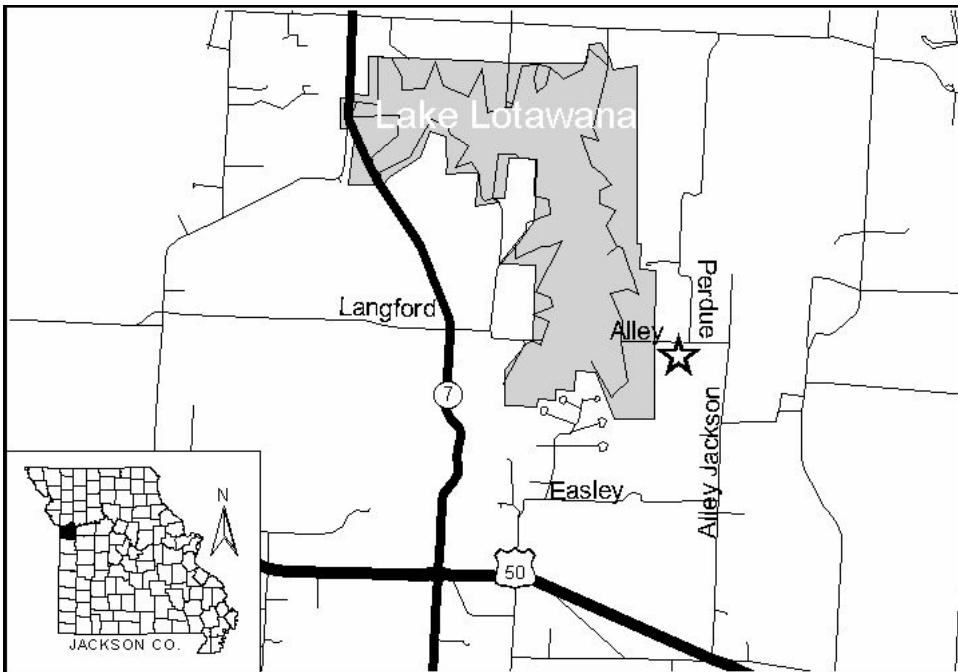
Health Assessment:

Routes of exposure include ingestion, direct contact and inhalation. Present or future use of the property could result in exposure via dermal contact, inhalation or ingestion of contaminated soils or liquids. Although the area is sparsely populated, residents in the area could be affected if the groundwater used for drinking were to become contaminated. Future use of the area could include the development of adjacent properties, thereby increasing the population potentially at risk. Offsite migration of chemicals occurred in the past due to seepage from one of the ponds. Solid waste is being dumped near the lagoons. This indicates some exposure through inhalation of dust or dermal contact could be occurring.

Contaminated water and much of the sludge and soil were excavated and removed during a cleanup begun in November 1988. Several samples taken after this cleanup found levels of lead in the lagoon bottom and sides above the DHSS' recommended level. Joplin had planned to perform additional removal of material from the ponds, which would have minimized exposure and risk to the public's health. However, no remedial work has been performed for a number of years. The video monitoring initiated by the city to prevent dumping was discontinued several years ago. Based upon the available information, this site remains a public health threat.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Lake Lotawana Sportsmen's Club



Site Name: Lake Lotawana Sportsmen's Club

Classification: Class 3

Date of Placement: July 31, 2001

Address: 29709 Alley Road, Lake Lotawana, Jackson County, Missouri

Present Property Owner: Lake Lotawana Sportsmen's Club, Inc.

Lead Agency: DNR

Waste Type: Lead

Quantity: Not determined

Site Description:

The Lake Lotawana Sportsmen's Club Site is an active private sport club that has operated as a recreational small arms firing range since 1977, under a special-use permit from Jackson County. The site, approximately 60 acres in size, has unrestricted access and is surrounded by nearby residences.

A formal complaint was registered with the Missouri Department of Natural Resources regarding possible lead contamination. The

site was referred to the department's Hazardous Waste Program (HWP) for investigation in September 2000. A Pre-CERCLIS (Comprehensive Environmental Response, Compensation and Liability Information System) Site Screening (SS) investigation was completed by the HWP on March 29, 2001. Lead, associated with the operation of the firing range, is the primary waste of concern.

Environmental Problems and Areas of Concern Related to Site:

Surface soils contain elevated concentrations of lead, as high as 4,700 ppm. One sample contained leachable lead at a concentration of 181 ppm, exceeding the Toxicity Characteristic Leaching Procedure regulatory limit of 5.0 ppm, making this sample characteristic hazardous waste based on toxicity. Low concentrations of lead were detected in downgradient sediment samples collected from an intermittent stream, indicating that some lead is migrating off site. However, no significant accumulation of lead is expected in the stream.

Remedial Action at the Site:

The SS investigation concluded that, under current site conditions, no significant exposure risk is present through the soil pathway or

surface water pathway. Access to the contaminated soil is limited as long as the site remains a firing range. Further action under CERCLA authority was not recommended, provided that institutional controls are in place and state oversight of future activities is ensured. However, the site may be eligible for further CERCLA investigation if the firing range is closed and the property is used for other purposes, such as residential development, thereby increasing the risk of exposure to lead-contaminated soil.

General Geologic and Hydrologic Setting:

The site is located in the Osage Plains subdivision of the Central Lowlands physiographic province, just south of the inferred southern limit of glaciation. This area has narrow, thin loess-covered ridges composed of moderately permeable silt and silty clay, with low permeable clay increasing with depth, and a thickness of 10 to 20 feet. Drainageways dissect these ridges. Below the loess-covered ridge, the slope is steeper, and the loess has been eroded, exposing residual soil 5 feet thick or less, composed of more permeable stoney silty clay.

Pennsylvanian-age bedrock of lower Kansas City Group consists of cyclic deposits of shale and limestone with low overall permeability. Groundwater, which accumulates on Pennsylvanian-age shales, is pumped from shallow wells. The depth to groundwater is about 30 to 40 feet below ground surface. A perched seasonal water table of 2 to 3 feet has been reported for soils on the steeper side slopes. Local shallow groundwater flow is expected to mimic topography and flow to the southwest toward Lake Lotawana. Regional groundwater flow is expected to be to the north toward the Missouri River. The aquifer underlying the site contains thick limestone units that yield water from bedding planes, fractured intervals and above shales. Recharge to the aquifer in this area is very limited, only from direct precipitation infiltration. The Kansas City Group is underlain by thick shale of the Pleasanton Group, which is considered to be non-water-bearing and a barrier to deeper, highly mineralized water-bearing units.

Surface water flows to the south to an intermittent stream, which enters Lake

Lotawana. Lake Lotawana discharges to the West Fork of the Sni-A-Bar Creek. Sni-A-Bar Creek enters the Missouri River in western Lafayette County.

The potential for groundwater contamination is low to moderate in this area due to low permeabilities of the underlying bedrock. Surface water is much more susceptible to contamination than the groundwater system.

Public Drinking Water Advisory:

Lake Lotawana and the unincorporated area to the east and south of Lake Lotawana are all served by Jackson County Public Water Supply District #15, which buys water from Independence and Kansas City. No sources of public drinking water are affected.

Health Assessment:

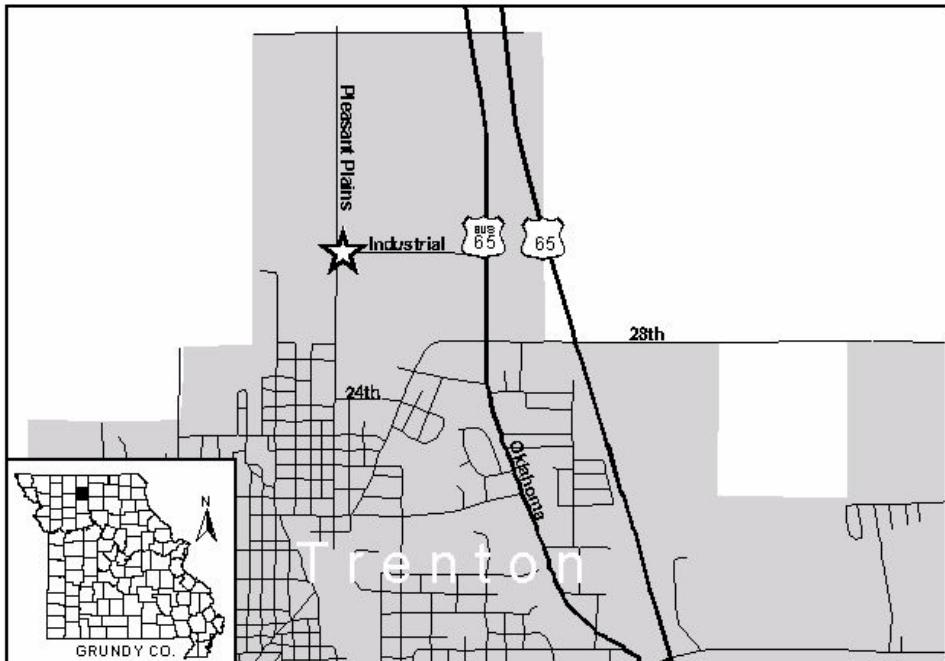
Lead attacks the kidneys, blood, gingival tissue, gastrointestinal tract, reproductive and central nervous system. At high levels, lead may decrease reaction time, cause weakness in fingers, wrists or ankles, and possibly affect the memory. Prolonged exposure to elevated levels causes decreased IQ's and behavioral problems in children. Lead can also cause neuromuscular effects and high blood pressure in adults.

The primary health concern is human exposure from ingestion and inhalation. Club members and the general public may incidentally ingest and inhale unacceptable amounts of lead-contaminated dust by way of shooting activities at the site. Lead released to the air may travel long distances before settling to the ground. Tracking of lead-contaminated dust off site is a primary health concern because of the documented high levels found throughout the area.

Based on available information, a health threat exists. In order to accurately assess the impact this site may have on public health, more thorough characterization is needed.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Modine Manufacturing



Site Name: Modine Manufacturing

Classification: Class 3

Date of Placement: January 8, 1996

Address: 822 Industrial Drive, Trenton,
Grundy County, Missouri, SW 1/4, Sec. 9,
T. 61N, R. 24W

Present Property Owner: Modine
Manufacturing

Lead Agency: DNR

Waste Type: Heavy metals and chromium

Quantity: Not determined (See Site Description)

Site Description:

Modine Manufacturing Company has manufactured truck and car radiators at the present location since 1968. Disposal practices in the late 1970's led to the contamination of soil in one portion of the facility. This area, a former sludge pit, is contaminated with a variety of metals. About 36,000 gallons of sludge may have been disposed in this pit over a three-year period.

Modine disposed of the metal hydroxide sludge through the Trenton sanitary system from 1968 until 1971. In 1971, an unlined pit was constructed, about 75 by 16 feet and 10 feet deep, to contain the metal hydroxide waste. The sludge pit was used from 1971 until 1976. In 1976, Modine built an addition to the manufacturing facility, which included a wastewater treatment facility.

When Modine ceased using the pit for metal hydroxide waste, the pit was allowed to dry. Soils and construction debris then were used as fill material over the dried waste.

Environmental Problems and Areas of Concern Related to Site:

Surface water and groundwater are potentially at risk of contamination if metals migrate from the capped pit. Small areas have eroded at the south edge of the surveyed area, which is over 100 feet from the pit.

Remedial Actions at Site:

On June 22, 1994, the EPA completed a Site Inspection that included collection of soil samples from the former sludge pit. Three of the six samples exceed the maximum regulatory limit for the Toxicity Characteristic

Leaching Procedure (TCLP) for chromium. Chromium was detected to about 5 feet below the surface. Modine capped the area with clay and topsoil in October 1998. The area was seeded, and vegetative cover is now well established and well maintained.

General Geologic and Hydrologic Settings:

This site is located on the Dissected Till Plains of northern Missouri. The area is blanketed by a layer of low-permeability till, consisting of a poorly-sorted mixture of clay to boulder-sized particles. The till is covered by a thin mantle of loess, or wind-deposited silt.

Bedrock composed of shale, limestone, clay and sandstone is present at a depth of 50 to 100 feet below the surface.

Gravel layers within the till provide the primary source of groundwater for this area. Yields from wells in the till are generally low, though very high yields may be obtained from pre-glacial stream deposits. These types of stream deposits are known to exist east of the city of Trenton at a distance of more than 2 miles from the site.

Water from the consolidated bedrock is highly mineralized. The mineral content increases with depth. Wells drilled to a moderate depth into bedrock may yield a limited amount of water that is of marginal quality.

Public Drinking Water Advisory:

No public water supplies are expected to be affected by this site. The nearest sources of public drinking water are the surface water intakes for the city of Trenton, but the site is not within those watersheds, and the nearest public wells are 18 miles away.

Health Assessment:

The metals that exceed health-based levels are cadmium, chromium, copper, lead and zinc. See Appendix A for related health effects.

The metals present at the site are mobile. Consequently, both surface and groundwater are at risk. An investigation by the Missouri Department of Health in May 1998 found that no private wells are present near the site.

Based on available information, a health threat exists at this site. Offsite migration of wastes has occurred.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Nufarm



Site Name: Nufarm

Classification: Class 3

Date of Placement: August 3, 1998

Address: 317 Florence Road, St. Joseph, Buchanan County, Missouri, Sec.19, T 47N, R 35W, St. Joseph South Quadrangle

Present Property Owners: Nufarm, Inc.

Lead Agency: DNR

Waste Type: 2,3,7,8-TCDD (dioxin) and 2,4,5,-TP (Silvex)

Quantity: Not determined

Site Description:

In 1956, Amchem Products began operation of a herbicide formulation and metalworking products facility in St. Joseph on a parcel of 7.84 acres. Amchem formulated herbicides that primarily contained the active ingredients 2,4-D and 2,4,5-T. These formulations sometimes produced the unwanted byproduct dioxin. The facility ceased formulating these herbicides in 1975.

Soon thereafter, Union Carbide purchased the property and formulated other herbicides. In 1986, Rhone-Poulenc bought the herbicide formulation facility. The company acquired only the property (2.5 acres) that contained the facility. Union Carbide retained the remaining 5.34 vacant acres. In December 1997, Rhone-Poulenc sold the 2.5-acre property and facility to Nufarm Inc.

Contamination at the two properties dates from the period between 1956 and 1975 when herbicides containing dioxin were formulated. The 5.34-acre property retained by Union Carbide is the former location of a lagoon used for waste disposal. The 2.5-acre Nufarm Site contains the storage tank and rail area, where railroad cars transporting chemicals and herbicides were loaded and unloaded. Spillage during the loading process is the probable source of soil contamination. In 1985, samples taken by the U. S. Environmental Protection Agency show dioxin levels above the residential health-based screen levels for the eastern Missouri dioxin sites, at 7.1 parts per billion (ppb) in the rail area, and at 4.5 and 3.4 ppb at the surface in the storage tanks area. The common cleanup standard for dioxin is 1 ppb at less than 1 foot in depth or 10 ppb at greater than 1 foot. The Nufarm Site is south of the Union Carbide

Site. Both properties are listed on the Registry. The site is fenced with a locked gate.

Environmental Problems and Areas of Concern Related to Site:

The Missouri River is about 50 yards away. Groundwater has not been thoroughly evaluated at the site.

Remedial Actions at Site:

Samples were collected in 1988 by Pacific Environmental Services for Union Carbide. No dioxin was detected in the railcar area, although 2,4-D was found at a low level. The tank storage area, which is near workers and is heavily trafficked, was not resampled. The area may have been capped due to heavy traffic, and for this reason was not sampled.

In July 1995, planned repairs to the deteriorated rail siding initiated a soil characterization study at the site. One sample revealed dioxin at 1.1 ppb. The value was later revised following retesting; the retested value was .41 ppb. In this area, about 1 foot of gravel had to be excavated before soil was encountered. However, 2,4,5-TP (silvex) failed the Toxicity Characteristic Leaching Procedure (TCLP) at 4.6 ppm when all sample areas were composited.

General Geologic and Hydrologic Setting:

The Nufarm Site is located on the alluvium of the Missouri River flood plain. The 60- to 100-foot thick alluvium consists of low permeability, fine grained clay and silt at the surface, grading with depth to coarser sand and gravel units with high permeability. Sand units are typically encountered within 20 feet below grade, and the gravel seams are present nearer the alluvium/bedrock contact. Depth to the water table is 10 to 20 feet. The alluvial aquifer, which is an important source of water for local industry, is in direct hydraulic communication with the Missouri River.

Under normal flow conditions, groundwater beneath the site flows west toward the Missouri River. The site is subject to occasional flooding from the river. High river stages could reverse the groundwater flow

direction. High-yield wells in the vicinity of the site may also affect the direction of groundwater flow. Release of contaminants at the site would readily affect the alluvial aquifer through direct infiltration and dissolution.

The bedrock beneath the site is composed of Pennsylvanian-age limestones and shales. Since this type of bedrock exhibits low permeability, release of contaminants would have minimal effect on the bedrock aquifer. Due to the heavy mineralization of water within the bedrock, this aquifer is not used as a water source.

Public Drinking Water Advisory:

The site is downstream from St. Joseph's former drinking water river intake and the new drinking water well field. No other sources of public drinking water are in this area, and none should be affected by this site.

Health Assessment:

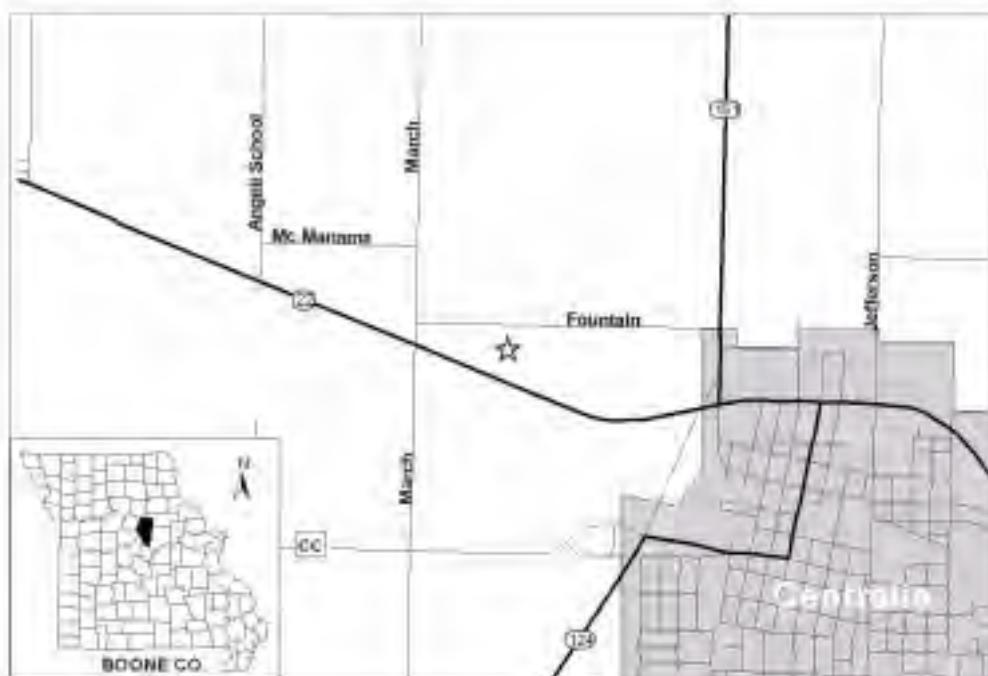
Dioxin (2,3,7,8-TCDD) is one of the most toxic substances known; however, its toxicity varies greatly between species. Animal studies have shown that dioxin produces acneogenic, carcinogenic, immunogenic, mutagenic, fetotoxic and teratogenic effects. In humans, it sometimes has an acneogenic effect (chloracne). It is also suspected to cause soft tissue sarcoma, non-Hodgkin's Lymphoma, Hodgkin's disease, and porphyria cutanea tarda.

The site is located in an industrial area, but there are residential neighborhoods less than one mile north, and less than one-half mile southeast. The site is fenced and much of the dioxin contamination on the Union Carbide portion is subsurface, covered by clean soil and gravel. Samples taken on the NuFarm portion of the site, however, were near the surface and accessible to employees.

Based on these soil sample results, a potential health risk exists at this site.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Old Centralia Landfill



Site Name: Old Centralia Landfill

Classification: Class 3

Date of Placement: August 20, 1990

Address: 0.6 miles west of Centralia, Boone County, Missouri, along north side of Highway 22, SE 1/4, NW 1/4, Sec. 9, T. 51N, R. 11W, Centralia Quadrangle

Present Property Owner: City of Centralia

Lead Agency: DNR

Waste Type: Metals (primarily lead)

Quantity: Not determined

Site Description:

The Old Centralia Landfill was operated by the city of Centralia from 1950 to 1961 for the disposal of municipal and industrial solid waste. The landfill was operated as an open dump that was occasionally "open burned" and covered with soil. Missouri Department of Natural Resources reports indicate unknown quantities of potentially hazardous materials, generated by the A. B. Chance Company, were also disposed periodically at the landfill

and burned in the open. Analytical results substantiate that hazardous materials were disposed at the site. Soil samples contain metals at elevated levels. Lead has been identified as the primary contaminant of concern in the soil at the northeast corner of the landfill. Lead levels detected in this area are significantly above background and health-based screening levels, therefore characterizing this material as hazardous. The site has been inactive since 1961.

Land in the immediate vicinity is used primarily for agricultural row crops. Farmhouses are scattered in all directions except to the east where the city of Centralia lies. The nearest residence is about one-half mile. Goodwater Creek flows adjacent to the site on the east side.

Environmental Problems and Areas of Concern Related to Site:

Vegetation has been damaged, and there may be residual effects on growth. Vegetation is very sparse in the lime dump area. In 2002, soil on the north end of the site was re-worked to control erosion. Elevated metals detected in sediment samples from nearby Goodwater Creek indicate metals have migrated. Past leachate seeps have been documented.

Remedial Actions at Site:

A Site Inspection (SI) was completed by the department in 1990, and the results were forwarded to the EPA. The department requested that the EPA assess this site for a potential removal cleanup under Superfund.

During 1992, the city of Centralia fenced the site, posted "No Trespassing" signs at the perimeter, and installed a locked gate to eliminate access to the property. However, since 1992, annual inspections by the department repeatedly find the signs and gate damaged or inoperable. Debris found on site also indicates trespassing.

General Geologic and Hydrologic Setting:

The landfill is located in an upland setting on a nearly flat, glaciated plain. The site is characterized by 50 to 60 feet of glacial till, overlain by 3 to 5 feet of loess topped with 2 to 3 feet of silty clay. Sand and gravel lenses may be present in the glacial till, but coarse-grained deposits are not continuous over a wide area. This profile represents undisturbed conditions; the depth of the landfill cut and the origin of the cover is unknown.

Geologic mapping indicates that the bedrock underlying the site is composed of Pennsylvanian-age shales, limestones, clay, and coal beds. The glacial till and shaly bedrock have low permeability and thus form a confining layer that minimizes the likelihood of leachate migrating into deeper groundwater supplies. Only shallow or poorly-constructed wells would be affected.

Public Drinking Water Advisory:

Boone County Public Water Supply District No. 10 is located 0.25 miles southwest of the site. The city of Centralia is served by three deep wells, located 1.25 to 2.25 miles from the site. Nearly all wells are about 1,400 feet deep, with a minimum of 460 feet of casing. They draw water from the Gasconade Formation of Ordovician age. According to the department's Geological Survey and Resource Assessment Division, the bedrock aquifers in the area (and, therefore, the city wells) would not be expected to be

significantly impacted by potential releases from the site.

Health Assessment:

Contamination of surface water is the primary community health concern around this site. Surface water is more at risk of contamination than is groundwater. However, the latter cannot be disregarded as seepage from the buried wastes is occurring, and in time, contaminants could reach the groundwater. The contamination of Goodwater Creek is of some concern to public health as the creek ultimately empties into Mark Twain Lake. Centralia is served by two deep wells but there are no reports of other groundwater use in the immediate vicinity.

Elevated levels of copper, lead and nickel were found in the soil of the northeast corner of the site. Analysis of downgradient sediment and water samples indicated that contaminants have moved offsite. Even though phenanthrene was found in only one sample, the presence of other polynuclear aromatic hydrocarbons is expected because of past burning practices.

The most likely routes of exposure are through direct contact with contaminated soil and surface water. However, there is also potential for shallow groundwater contamination. The Missouri Department of Health and Senior Services annually samples private wells near the site and has never detected any contaminants in the water.

Based on available information, the contaminants in the Old Centralia Landfill site present a health threat to the general public. The fact that contaminants have moved offsite presents a potential risk, because they are persistent in the environment and could eventually flow into Mark Twain Lake. Two other considerations are that the contaminants could migrate into the groundwater and the public is disregarding the access restrictions and is exposed when trespassing.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Plattco Landfill-Riverview Property



Site Name: Plattco Landfill-Riverview Property

Classification: Class 3

Date of Placement: September 14, 1998

Address: FF Hwy, Parkville, Platte County, Missouri, Sec. 30, T. 51N, R. 34W, Wolcott Quadrangle

Present Property Owners: Browning-Ferris Industries (BFI)

Lead Agency: DNR

Waste Type: Industrial waste

Quantity: Not determined

Site Description:

This site is one of two contiguous landfill properties owned by Browning-Ferris Industries (BFI) of Kansas City. The Plattco-Riverview property is the earliest landfill, encompassing about 70 acres. Owned by the Riverview Land Association, it was operated by Doepke Disposal as a sanitary landfill from 1969 until 1971. In 1971, Doepke Disposal was purchased by BFI, who continued to

operate the landfill until its closure in 1978. While the original site was undergoing closure, an expansion site of about 60 acres was permitted by the Missouri Department of Natural Resources for operation as a sanitary landfill. The second site was owned by Mr. and Mrs. Frank Douglas and leased by BFI. It adjoins the original landfill on the north side.

Prior to the Resource Conservation and Recovery Act, and between 1969 to 1972, a variety of industrial and residential wastes were deposited at this site. Since formal waste identification records and transport receipts are non-existent, the exact quantities and characteristics of industrial waste in the landfill are subject to speculation. However, intermittent inspection reports by the Missouri Department of Health and Senior Services, and statements by the former operator, A.W. Doepke, indicate that until 1972, the landfill did accept waste liquids, sludges and solids from local commercial and industrial operations. The presence of ignitable, corrosive and toxic wastes in significant quantities is highly probable, though unconfirmed.

The wastes reportedly disposed at the site include wastewater treatment sludges and refinery sludges from industrial firms such as

Mobay Chemical (Chemagro), Amoco Oil Refinery-Sugar Creek, Phillips Petroleum, Hobart Manufacturing, General Motors, Trans World Airlines, and Sealright Manufacturing. Clarifier sludges, filtration sludges, paint sludges, solvent wastes, off-spec pesticides, refractory slag, and air pollution residues are alleged to have been deposited by the waste generators named above.

Sometime in 1972, acceptance of liquid and semi-liquid industrial wastes at the Plattco Landfill was discontinued, according to past and present BFI officials. However, the landfill continued to accept treatment sludges, refinery wastes and air pollution control residues. Some of these wastes were commingled with solid wastes at the landfill face, but the bulk of the wastes (including Chemagro sulfur and manganese dioxide residues) were deposited in special waste trenches on the eastern and southeastern quadrants of the landfill site.

Quantifying the amount of waste on site is difficult due to the lack of records detailing the types and quantities of wastes deposited in the initial landfill prior to 1977. However, preliminary observation suggests that organophosphate and organochlorine pesticide wastes, paint waste, solvents (halogenated and non-halogenated), petroleum sludges and residues containing heavy metals are present at the initial landfill site. Officials from BFI speculate that some of the wastes alleged to have been disposed at Plattco in the EPA notifications were, in fact, disposed at the Missouri City permitted hazardous waste landfill (also listed on the Registry), operated by BFI beginning in 1974. This assertion is unconfirmed.

Environmental Problems and Areas of Concern Related to Site:

This site is within the Missouri River flood plain and within 0.25 mile of Rush Creek. The annual Registry inspection report noted some erosion in drainage areas. A fence surrounds the site and gates are locked.

Remedial Actions at Site:

Results from a 1982 sampling event indicated trace amounts of dichloroethane, methylene

chloride and trichloroethylene in a leachate sample taken from the sump. Runoff from the landfill to the siltation pond may have diluted contaminant concentrations to below the detectable levels. On April 3, 1985, sampling was conducted at both landfill sites. Downstream samples indicated elevated levels of Group III metals and some heavy metals. Samples obtained from the siltation pond and leachate collection sump revealed detectable levels of chlorinated alkanes, ethyl benzene phenols, phthalates, and pesticide components. Preliminary indications revealed an increased presence of priority contaminants in the upgradient sedimentation pond, used previously as a reservoir for returned leachate. Minimal levels of heavy metals (primarily barium and chromium) were observed in the sediment and leachate samples. Sampling and analysis of surface water and leachate streams generated from the landfill have not revealed consistent, detectable levels of priority pollutants. However, the presence of organic and inorganic contaminants has been documented on several occasions.

In December 1997, this site received approval for final closure from the department's Solid Waste Management Program (SWMP). BFI contracted with Heritage Environmental to conduct quarterly sampling of the leachate being collected at the landfill. In 1998, samples were analyzed for hazardous waste characteristics using the Toxicity Characteristic Leaching Procedure (TCLP), and results did not exceed any TCLP regulatory levels. The SWMP reports that Plattco Landfill is currently in compliance with its closure requirements.

General Geologic and Hydrologic Setting:

The site is located on the bluffs above the Missouri River. The bluffs rise over 220 feet above the Missouri River flood plain. Exposed at the base of the bluffs are Pennsylvanian-age limestones and shales. The Pennsylvanian bedrock beneath the site exhibits typically low permeability; release of contaminants would have minimal effect on the bedrock aquifer.

The bedrock is mantled with a thick (about 70 feet) cover of Wisconsin-age loess and glacial

till. The loess consists primarily of silt, but the till can contain silt, sand, extensive sand stringers, and pebbles. Loess and glacial till are usually considered to be of low to moderate permeability, but till can be highly permeable where sand stringers are present. Depth to the water table can vary greatly over a short distance, due to the presence or absence of saturated sand stringers.

Saturated sand stringers serve as individual domestic water resources for both household and stock use. Individual sand stringers are isolated and seldom extend more than a few hundred feet. Contamination released to a sand aquifer would be limited in extent to localized areas adjacent to the site.

Surficial water drains from the Plattco Landfill-Riverview Site and flows off the bluffs to enter Brush Creek. Brush Creek meanders across the alluvium of the Missouri River. The alluvium consist of 60 to 100 feet of low permeability fine-grained clay and silt at the surface, grading with depth to coarser sand and gravel units of high permeability. Brush Creek is in direct hydraulic communication with the alluvial aquifer. Well records indicate that the alluvial aquifer is not currently being used as a drinking water source in this area.

Public Drinking Water Advisory:

This site is 4.5 miles from the Parkville wellfield. Public drinking water sources should not be affected by this site.

Health Assessment:

The uncertainty associated with the types and volume of hazardous waste make it difficult to discuss possible health effects. Some pesticides affect the nervous system directly

while many interfere with cholinesterase and suppress the transmission of nerve impulses. Most solvents are central nervous system depressants that can also cause dry skin and dermatitis. Some are carcinogenic. Heavy metals can cause a variety of health symptoms, including negative effects on every organ system.

Presently, the only observed route of contaminant migration off site is the discharge periodically observed emanating from the leachate collection sump area. A leachate collection system, siltation basin, and underground sump have obviously been neglected. This has been considered the main source of off-site migration of waste. A creek flows just north of the site. A camp for children is located 0.4 miles to the north. A shooting range is located to the east with a pond located on the southwest part of the range. Overland flow of surface discharge could lead to exposure through ingestion of contaminated surface water or groundwater. Contamination of the Missouri River alluvial aquifer may also be possible. A section of fence on the south (Riverview) portion of the site remains absent.

Based on the available information and given the absence of local groundwater sampling data, the potential for direct exposure exists. Given the uncertainty of the types and concentrations of hazardous substances disposed of at this site, the potential for adverse effects cannot be discounted.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Prier Brass



Site Name: Prier Brass Manufacturing Company

Classification: Class 3

Date of Placement: July 14, 1986

Address: 7801 Truman Road, Kansas City, Jackson County, Missouri, Independence Quadrangle

Present Property Owner: Land Trust of Jackson County and CST, L.L.P.

Lead Agency: EPA

Waste Type: Lead and cadmium

Quantity: Not determined

Site Description:

This site is located in an industrial area of Kansas City. This facility was formerly a manufacturer of various brass products. The facility operated from 1907 until 1985 before going bankrupt. Lead-contaminated foundry wastes and baghouse dust were dumped here over a period of several years. A March 1993 fire at the abandoned facility destroyed roof structures and building interiors.

CST, L.L.P. purchased a portion of the site in 1997. Garages were constructed for the maintenance of vehicles and other uses such as repairing skids. Extensive grading with gravel cover has been performed on the eastern section and new concrete paving has been poured in several areas. Access to the property is restricted partially by a fence and gate; however, the site is accessible from the Big Blue River side.

Environmental Problems and Areas of Concern Related to Site:

The potential for groundwater contamination at the site exists. The Big Blue River rechannelization project by the U. S. Army Corps of Engineers is going directly through the southwest side of the facility. The Blue River project began in 1996 and is moving the channel away from the facility. A new segment of Manchester Street is being constructed between the west side of the facility and the Blue River.

Remedial Actions at Site:

The Missouri Department of Natural Resources conducted both a Site Inspection and a Preliminary Assessment of the site. Extraction Procedure (EP) toxicity tests

revealed that the foundry sand contained unacceptable levels of leachable lead and that the baghouse dust contained unacceptable levels of leachable lead and cadmium.

The department referred the site to the EPA. The EPA sampled and assessed the site to determine the extent of contamination. The EPA completed a removal action in February 1996. Contaminated material was removed, stabilized, and shipped off site for disposal. The EPA designated 1,000 parts per million as the lead action level. The excavated areas were filled with clean fill. Additional cleanup actions are not planned.

Contaminated foundry wastes remain under a portion of the building. The EPA and the Agency for Toxic Substances and Disease Registry (ATSDR) determined that leaving the waste underneath the building is protective of human health. On June 16, 1997, the EPA and CST, L.L.P., entered into a prospective purchaser agreement for a portion of the Registry site that CST purchased. The department approved a Registry change in use request made by CST for development of the site as an operational base for a construction company.

General Geologic and Hydrologic Setting:

The site is located next to the Blue River. On site soils are a mixture of fill material, underlain by alluvial deposits of clay, silt, sand and gravel. Bedrock at depth is composed principally of interbedded shale and limestone. Typically, the bedrock is characterized by low permeability.

The potential exists for off-site contamination on the surface due to the proximity of waste materials to the Blue River. Floodwaters and surface runoff may wash these contaminants into the river. However, the potential for off-site migration via surface water has decreased with the completion of a removal action.

Depth to the water table is expected to fluctuate with the river stage, but is probably between 10 and 25 feet below the flood plain surface. Contaminants in solution could potentially affect the shallow groundwater supplies of the Blue River alluvium. Although

the alluvial sediments under the area of waste disposal have not been fully characterized, it is likely that the effects of contamination on shallow groundwater are extremely localized.

Public Drinking Water Advisory:

The site is located on the Blue River, about 7 miles from its confluence with the Missouri River. The wells serving the city of Independence are located in the Missouri River alluvial plain, 10.5 miles downstream from the site. Several major municipalities use the Missouri River as a source of drinking water; the one nearest the Prier Brass Site is Lexington, which is 42 miles downstream. Unless a major release of contaminants occurs, the site is not expected to significantly impact downstream water systems.

Health Assessment:

Lead attacks the central nervous system, kidneys, blood, intestinal tract, and gingival tissue. Prolonged exposure can cause irreversible damage. Children are especially susceptible to permanent central nervous system damage. Cadmium attacks the lungs, blood, respiratory tract, and prostate.

Contaminated foundry wastes remain under a portion of the main building. Doors are open allowing free access to the area. Access to the front of the site is partially restricted by a fence and gate; however, the site is accessible from the street on the Big Blue River side, which was reportedly recently used as the route to vandalize the property. The previously installed 4 inch layer of gravel has been pressed down into the ground, leaving exposed soil that becomes muddy and pools water in wet weather.

Reoccupation of the site, coupled with recent and ongoing renovation activity raises the possibility of worker and visitor exposure to contaminants still present under the main building.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Rall Leasing



Site Name: Rall Leasing

Classification: Class 3

Date of Placement: July 25, 1995

Address: South of Cuba, Crawford County, Missouri - Within Industrial Park, East of Hwy. 19, NE 1/4, NE 1/4, Section 6, T. 38N, R. 4W

Present Property Owner: Rall Leasing Associates, a partnership

Lead Agency: DNR

Waste Type: Trichloroethylene (TCE)

Quantity: Not determined

Site Description:

The site is located in a rural industrial park. Durban-Durco formerly owned the site and operated an automobile parts manufacturing facility. Specialty Polymer Services Inc. now operates a plastic recycling company on site.

The building near an alleged spill is being used as a warehouse and plastic storage facility. In February 1990, soil samples collected from four borings next to the main

building had levels of TCE up to 1,600 parts per million (ppm), which exceeds a Missouri Department of Health and Senior Services' (DHSS) standard for TCE of 340 ppm. The highest level detected in the March 1991 sampling was 46.5 ppm. No explanation for these differences was suggested by the consultants' verification report. Possible explanations include laboratory error, spotty contamination pattern, recent removal or disturbance of the contaminated soil, or that the TCE contamination was quite recent at the time of the 1990 sampling event.

Three of the 1991 samples were dense, fine sand collected from the top of the bedrock surface, and TCE was not detected in these samples. Although encouraging, it did not verify that contamination of the groundwater had not occurred. Discrete conduits to the lower groundwater may exist, which might not be detected in random sampling. If ten years had passed since the release, as stated in the report, the concentrations found in soil may only be residual and the majority of the spill may be in the groundwater.

A residence is occupied about 0.2 miles from the spill site. Three more houses are outside within 0.3 miles. Although the site is not fenced, public use of the area is minimal.

In 1997, several private wells were sampled by the DHSS and the Missouri Department of Natural Resources. Although sample results were somewhat inconclusive, there does not appear to be a current significant threat.

Environmental Problems and Areas of Concern Related to Site:

The TCE contamination will remain a concern until additional site work proves otherwise.

Remedial Actions at Site:

Previous negotiations for a Consent Agreement between the department and Rall Leasing, which would provide for characterization and cleanup, have ended. Additional investigation is necessary to determine the extent of TCE contamination.

General Geologic and Hydrologic Setting:

The Rall Leasing Site is located on a high ridgeline extending from a broad upland area at the south edge of the city of Cuba. The land surface is nearly flat, but moderate to steep slopes exist within a short distance to the east and west, where headwater streams of the Meramec River meet the edge of the upland area. Surface water runoff drains either west to Pine Branch or east to a tributary of Lic Creek; both are tributaries of the Meramec River.

Boring logs obtained during site investigations indicate that depth to bedrock varies from 4.5 to 19 feet below the surface. The near-surface bedrock is undifferentiated Pennsylvanian-age sandstones, siltstones, shales, and sand- to boulder-size carbonate pieces. Typically, the unit effectively restricts downward migration of water. The thickness, composition and elevation of this unit may vary considerably over short lateral distances. Drilling records of wells near the site indicate the thickness of the Pennsylvanian deposits varies from 40 to 70 feet. Ordovician-age cherty dolomite and sandstone bedrock is present beneath the Pennsylvanian bedrock. These Ordovician bedrock units compose the Ozark Aquifer.

Most private drinking water wells in the area are open to the Ozark Aquifer. The water

table elevation within this aquifer lies about 200 feet below the surface of the site. Groundwater is anticipated to move in a southerly direction toward the Meramec River. Perched groundwater may also exist in the uppermost bedrock or in overlying surficial materials.

Public Drinking Water Advisory:

The four water supply wells for the city of Cuba are located 1 to 2 miles north of the site. The wells are 600 to 1,050 feet deep, with 300 to 400 feet of casing, and are constructed into consolidated geologic formations. The water system serves about 2,500 people. Although no evidence exists to date of groundwater contamination, migration of contaminants from the site could potentially affect nearby drinking water wells.

Health Assessment:

The predominant health response from exposure to TCE is one of central nervous system depression. Some indication of injury to the liver and kidneys may also be observed, and TCE has been shown to be carcinogenic in animals.

The potential routes of exposure for the TCE include: direct contact with the contaminated soil or dust, inhalation of contaminated dust, ingestion of the contaminated soil, and ingestion of potentially contaminated groundwater (there are at least 8 private wells and one public well within a one-mile radius of the site).

Based on available information, a health threat may exist at this site. In order to accurately assess the impact this site may have on public health, the site needs to be more thoroughly investigated and characterized. Until a better site characterization takes place, it should be assumed that the site poses a health threat.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Reichhold Chemical



Site Name: Reichhold Chemical

Classification: Class 3

Date of Placement: March 15, 2001

Address: 249 St. Louis Avenue, Valley Park,
St. Louis County, Missouri.

Present Property Owner: Reichhold LLC

Lead Agency: DNR

Waste Type: Volatile organic compounds
(VOCs), primarily xylene

Quantity: Not determined; an unknown
volume of solvent was released,
contaminating about 48,000 cubic feet of soil.

Site Description:

The Reichhold Chemical Site covers 2.5 acres surrounded by industrial, commercial and residential property. Reichhold manufactures oil- and solvent-based resins. As part of the production process, industrial grade xylene is used to remove wastewater from the resin materials. The resulting xylene-wastewater mixture is collected in an aboveground 15,000-gallon decanter recovery tank in which the solvent is separated and retrieved for later

reuse. In 1997, a release of an unknown volume of solvent occurred from the decanter tank containment drain. The solvents migrated along the conduit of a buried wastewater line and contaminated soils.

The site, which is fenced securely, is covered with structures and a cement parking lot. The cement parking lot acts as a cap, protecting workers and other individuals from potential exposure to subsurface contamination.

Environmental Problems and Areas of Concern Related to Site:

Xylene and ethylbenzene are present at concentrations above health-based screening levels in the subsurface soil. The industrial grade xylene, a recovered chemical product, is listed as EPA hazardous waste U239. Subsurface contaminants may pose human health risks if excavation, accidental uncovering, or removal of the cement cap occurred.

The Reichhold Chemical Site lies above a TCE groundwater plume attributed to the Valley Park TCE Superfund Site. The plume is about 70 acres in size. A Remedial Investigation/Feasibility Study (RI/FS) for groundwater and subsurface contamination is in progress at the Valley Park TCE Site.

Remedial Action at the Site:

After a 1997 release of an unknown volume of solvent from the decanter tank containment drain, the faulty drain was repaired, the decanter tank containment was sealed, and the sewer lateral was plugged with cement to prevent further contamination of the sewer system. A recovery sump was installed in the sewer lateral to retrieve any free solvents that continued to infiltrate the sewer lateral, but very little solvent was recovered.

The department completed an Integrated Preliminary Assessment/Site Inspection/ Removal Site Evaluation in September 2000. The evaluation concluded that the soil contamination is effectively capped by the parking lot. Therefore, further action under the Comprehensive Environmental Response, Compensation and Liability Act was not recommended provided that institutional controls are in place and state oversight of future activities is ensured.

General Geologic and Hydrologic Setting:

The site is located nearly 0.3 mile north of the Meramec River on the 10-year flood plain. The surrounding terrain is flat with no levee between the property and the river. About 65 feet of moderately to highly permeable alluvium underlies the site. According to monitoring wells drilled near the property, the alluvial sediments predominantly comprise silty sand with some clay and gravel in the upper 35 feet, overlying 30 feet of sand and gravel.

Depth to groundwater averages 30 feet and fluctuates with the river level and pumping rates of the Reichhold production well. Alluvial groundwater is recharged by surface infiltration and discharge from the bedrock hills located north and west of the site. Groundwater flows within the alluvium toward the Meramec River to the south-southeast. Locally, the alluvial aquifer is used for industrial wells and Kirkwood municipal wells. Two public surface water intakes lie within 15 miles downstream of the site.

Bedrock consists of cherty, medium- to coarsely-crystalline Burlington-Keokuk Limestone. Voids have been found in the

underlying 200-foot thick Burlington-Keokuk Limestone. Therefore, the limestone bedrock is probably karstic. The bedrock aquifer is used as a drinking water source in the nearby upland areas, but not in the river valley.

Public Drinking Water Advisory:

Kirkwood's alluvial well field is less than 2 miles downstream. The department's Public Drinking Water Program delineated the recharge areas for alluvial wells and found that the recharge areas can extend for many miles upstream along the river valley. If contaminants from this site pollute the alluvial soil or groundwater, it represents a likely threat to Kirkwood's drinking water source.

Health Assessment:

Industrial grade xylene typically contains other solvents, and may be as much as 30 percent ethylbenzene. Xylene, ethylbenzene, benzene, and toluene are all central nervous system (CNS) depressants. Exposure to xylene, toluene and ethylbenzene can cause headache, dizziness, slurred speech and other symptoms characteristic of CNS depression. In addition, ethylbenzene can cause liver damage. Benzene can produce narcotic effects similar to the other solvents. Benzene can also cause heart damage and is a known human carcinogen (leukemia).

The primary exposure route of concern is through groundwater. Although not currently active, Valley Park's well field is downgradient and very near the site. A cluster of more than a dozen private wells is also downgradient. The most recent sampling in May 2002 showed that several of these wells were still impacted from a previous release from another facility, but that contaminants from the Reichhold facility were not present.

Based on available information, a health risk exists from this site. Given the location of the facility, significant impact to groundwater is expected.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

St. Charles FMGP



Site Name: St. Charles FMGP

Classification: Class 3

Date of Placement: December 8, 2000

Address: Intersection of North Riverside Drive and Monroe Street, St. Charles, St. Charles County, Missouri

Present Property Owner: City of St. Charles

Lead Agency: DNR

Waste Type: Coal tar, which contains volatile organic compounds (VOCs) and semi-volatile organic compounds, including polycyclic aromatic hydrocarbons (PAHs)

Quantity: Not determined

Site Description:

The St. Charles Former Manufactured Gas Plant (FMGP) Site is located in St. Charles' downtown historic district. The site is covered by an asphalt parking lot, with no visual remains of the former gas plant structures.

The FMGP structures associated with the St. Charles Gas Works, later called the St. Charles Gas Co. and the St. Charles

Class 3 Sites

Lighting Co., appear on historic Sanborn maps as early as 1886 to as late as 1929. The structures included a 35,000 cubic foot capacity gas holder, a 50,000 cubic foot capacity gas holder, a purifying room, raiser, retorts, two round underground tar tanks, and two square underground tar tanks. Some of structures from the past gas manufacturing facility might still be partially intact beneath the site.

The site was identified as part of a comprehensive, statewide effort by the Missouri Department of Natural Resources' Hazardous Waste Program (HWP) to locate FMGPs in Missouri and to evaluate the potential hazards posed by these sites. A pre-Comprehensive Environmental Response, Compensation and Liability Information System Site Screening (SS) report was completed by the HWP on March 30, 2000. Coal tar, a byproduct of the gas manufacturing process, is the primary waste of concern.

Environmental Problems and Areas of Concern Related to Site:

Subsurface soil samples collected from the approximate former location of the FMGP contained VOCs and carcinogenic PAHs at concentrations exceeding health-based screening levels. One sample contained

leachable benzene that exceeded the Toxicity Characteristic Leaching Procedure regulatory limit of 0.5 parts per million, making this sample characteristic hazardous waste based on toxicity. The coal tar remaining in the subsurface may pose human health risks, should any type of excavation or accidental uncovering occur in the future.

Remedial Action at the Site:

The SS report concluded that the asphalt parking lot should act as a cap, protecting workers and other individuals from potential exposure that may result from subsurface contamination. Further assessment, including the use of additional equipment to penetrate on-site concrete, would compromise the integrity of an apparently effective cap. Such action was not recommended at the time of the SS, provided that institutional controls are in place and state oversight of future activities is ensured. Further sampling will be recommended if the parking lot were to be removed.

General Geologic and Hydrologic Setting:

The site lies on a west slope along the Missouri River at the edge of the 100-year flood plain. Where not excavated or covered with fill, about 10 feet of silty, sandy loam with moderate permeability lie beneath the site.

Groundwater within the surficial materials recharges the Missouri River to the east. Precipitation has little chance of infiltrating the unconsolidated materials due to pavement and structures that cover the ground surface. Therefore, most water within the residuum originates from the Mississippian-age limestone hills to the west.

The Mississippian-age, finely-crystalline, 85-foot-thick St. Louis Limestone bedrock lies less than 10 feet deep. This limestone formation exhibits secondary dissolution features that add to its permeability. Deeper

strata include the 115-foot-thick, coarsely-crystalline Salem Limestone and the 115-foot-thick, fossiliferous limestone of the Warsaw Formation.

The deep bedrock aquifer is used in the local hills as a water source. However, due to the proximity of the site to the Missouri River, to which the aquifer discharges, the deep aquifer is not threatened.

Public Drinking Water Advisory:

The city of St. Charles' well field is 3.5 miles away in the Mississippi River alluvium. A St. Louis County river intake is located 7.5 miles downstream on the Missouri River. No other public drinking water sources are nearby. No effect on public drinking water is expected from this site.

Health Assessment:

Benzene is a central nervous system depressant and a known human carcinogen. Short-term exposure can result in dizziness, slurred speech, and other symptoms characteristic of depressants. Inhalation can result in irritation of the respiratory tract and pulmonary edema. Longer-term exposure can damage the heart and liver, and cause leukemia.

Currently, there appears to be little opportunity for human exposure because the site is covered by an asphalt parking lot.

Based on available information, a health threat does not currently exist at the St. Charles FMGP site. It is not known whether there is any groundwater impact, but there are no groundwater targets identified.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Service, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Stratman Lumber



Site Name: Stratman Lumber

Classification: Class 3

Date of Placement: November 22, 2000

Address: 0.1 miles east of the intersection of U.S. Highway 63 and County Road 331, north of Vienna, Maries County, Missouri.

Present Property Owner: Mickey Jones

Lead Agency: EPA

Waste Type: Pentachlorophenol (PCP)

Quantity: Not determined

Site Description:

The Stratman Lumber Site is located in a rural area just north of Vienna. Mid-Mo Post and Lumber Inc (known locally as Stratman Lumber), a wood treating facility, operated at the site from 1967 until 1979. The entire wood treating facility was originally 8 acres in size.

The company purchased, treated and sold wood posts and lumber of hardwood and softwood species. The wood treating operation was reportedly a vacuum system

consisting of three tanks connected by piping: a treatment tank where the wood was placed, a storage tank for the PCP, and an oil/water/impurity separator. Sometime in the 1960's vandals reportedly trespassed on site and loosened bolts on the wood-treating cylinder, allowing the PCP to spill onto the ground.

A subsequent owner dismantled and moved the wood treating tanks, established a sawmill operation, built an office, and fenced off the property. The sawmill operated for approximately one year with about five workers. The sawmill operation was stopped in 1995 because of the potential risk to workers from historical contamination.

Environmental Problems and Areas of Concern Related to Site:

PCP from wood treating processes are present at concentrations above health-based screening levels in subsurface soil. PCP wood treatment residuals are listed as EPA hazardous waste F032. The EPA designates PCP as a hazardous substance, hazardous waste, and priority toxic pollutant.

Surface water has been impacted by the site. Two documented fish kills have occurred as a result of runoff from the site. Because of the removal of highly contaminated soil, further

environmental impacts from this pathway would not be expected.

Remedial Action at the Site:

In 1997, the Missouri Department of Natural Resources conducted a Removal Site Evaluation to determine the extent of PCP contaminated soil. Analytical results from soil samples documented that an area of 4,440 square feet was contaminated with PCP to a depth of 3 feet (493 square yards).

In 1999, Ecology & Environment Inc. was tasked by the EPA to determine the extent of PCP contamination and assist in the subsequent removal action. On July 16, 1999, E&E delineated 110 14 by 14 foot cells around the contaminated area. The EPA established 220 parts per million (ppm) PCP as the site action level. Results from sampling events in July 1999 and previous department sampling results identified 19 cells suspected of exceeding the removal action level of 220 ppm. PCP was detected at concentrations up to 5,920 ppm.

Starting in November 1999, 19 cells were excavated to depths of contamination determined from previous sampling. Following excavation activities, further analytical data identified PCP contamination above the site action level in 11 cells. These cells were further excavated until sampling confirmed that PCP contamination levels were below the 220 ppm site action level. The excavated cells were then back filled with clean soil. The removal action was completed December 6, 1999. All known areas of PCP soil contamination exceeding the 220 ppm site action level were addressed by this removal action. However, soil containing PCP with concentrations exceeding residential health-based screening levels remains on site.

General Geologic and Hydrologic Setting:

The site is located within the Salem Plateau, part of the Ozark Plateau of the Interior Highlands Physiographic Province. It is situated on a ridge near the divide between the Maries and Gasconade Rivers. The site encompasses the divide between two small tributaries to the Gasconade River. The

southern part is within the Indian Creek drainage. The northern part drains toward Crumb Creek. The site is located about 1.9 miles west of and 285 feet higher in elevation than the Gasconade River.

The site is underlain by the Jefferson City Dolomite, a medium to finely crystalline dolomite. The lithology is variable and includes thin beds of clayey dolomite, brecciated chert, shale and occasionally sandstone. The Jefferson City Dolomite is covered by less than 10 feet of surficial materials, consisting of very little soil present over the thin cherty residuum. The bedrock below the site is not karst.

The Ordovician-age Jefferson City Dolomite is part of the Ozark Aquifer, which is the principal aquifer of the Salem Plateau region. In addition to the Jefferson City Dolomite, the Ozark Aquifer is composed of the Ordovician-age Roubidoux Formation and Gasconade Dolomite and the Cambrian-age Eminence Dolomite and Potosi Dolomite. The total thickness of the Ozark Aquifer at this site is expected to be 1,000 feet.

Residential wells obtain water from the Ordovician-age formations and the city of Vienna public drinking water well extends into the Potosi Dolomite. The depth to the regional water table is expected to be in the range of 100 to 150 feet below the ground surface. The direction of groundwater flow is unknown. Because of the low vertical permeability of the Jefferson City Dolomite, perched water may be encountered at the top of unweathered bedrock. It is believed that the Ozark Aquifer is not at significant risk of contamination from the site.

Public Drinking Water Advisory:

Wells serving the city of Vienna are about three-quarters of a mile south of this site. This puts Vienna's wells at a moderate risk of contamination. The Public Drinking Water Program has increased monitoring volatile organic compounds in Vienna's wells to a quarterly schedule. Tetrachloroethene has been detected in Well No. 3 but that detection is not thought to be related to the Stratman site and no imminent danger is expected.

Health Assessment:

The chemical of concern is PCP, a suspected carcinogen that can irritate the eyes, nose, throat and lungs. It can also irritate the skin and cause chloracne. It is acutely toxic; the lethal human oral dose is about one teaspoon.

The health concerns involve exposure to contaminated soil, surface water and groundwater. PCP remains in soil at concentrations up to 220 ppm. While this value is protective of the casual trespasser, it is not protective enough to allow residential development and is marginal for industrial use.

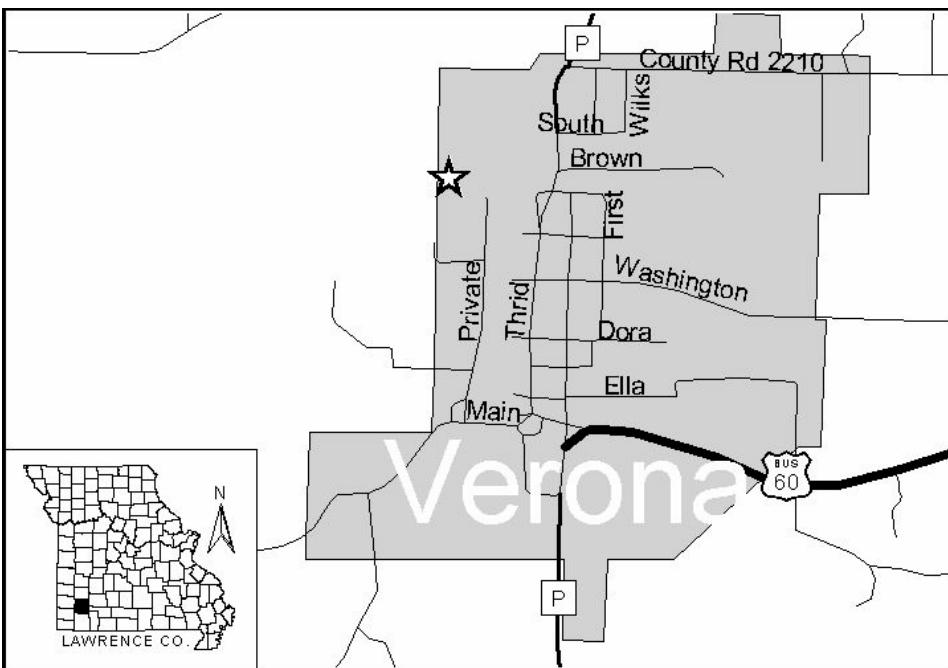
Surface water has been impacted by the site, causing two documented fish kills. Because of the removal of highly contaminated soil, further environmental impacts from this pathway would not be expected. Both the

department and the Missouri Department of Health and Senior Services sampled private wells in the vicinity. No PCP was found in any of the samples. It is possible, however, that there may be impacted groundwater near the site.

Based on available information, a limited health risk exists at this site. The site was remediated to the one-in-ten thousand lifetime cancer risk level, based on an industrial land-use scenario. In the past few years, a seed and fertilizer store, a church and a home have been built within 500 feet of the site. If the site were developed or becomes more accessible, unacceptable exposures could result.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Syntex - Verona (East)



Site Name: Syntex - Verona (East)

Classification: Class 3

Date of Placement: January 1, 1984

Address: First Street, Verona, Lawrence County, Missouri, SW 1/4, NE 1/4, Sec. 17, T. 26N, R. 26W, Verona Quadrangle

Present Property Owner: BCP Ingredients, Inc.

Lead Agency: EPA

Waste Type: 2,3,7,8-TCDD (dioxin)

Quantity: Not determined

Site Description:

This site is an active manufacturing facility located in Verona. The property is the former site of the Northeastern Pharmaceutical and Chemical Company (NEPACCO), whose chemical manufacturing processes are believed to have produced dioxin as an unwanted byproduct. Six distinct areas have been found to be contaminated with dioxin.

In fiscal 2002, at the request of the site owners, this site was divided into two separate Registry sites: the Syntex-Verona (West) Site, owned by Syntex Agribusiness, Inc., and the Syntex-Verona (East) Site, owned by BCP Ingredients, Inc. The Spring River divides the BCP property, including the manufacturing facility, east of the river from the property still owned by Syntex on the west side of the river.

For remediation purposes, the two properties are still treated as one site. All activities conducted by the U.S. Environmental Protection Agency (EPA) and all activities related to National Priorities Listing remain unchanged. Therefore the information below, required by Hazardous Waste Management Law, is identical for both sites.

Environmental Problems and Areas of Concern Related to Site:

Sample analysis has documented hazardous chemicals including dioxin at 1,380 parts per billion (ppb), tetrachlorobenzene at 465 ppb, 2,4,5-trichlorophenol at 244,000 ppb, 2,4,6-trichlorophenol at 134,000 ppb, and hexachlorophene at 170,000 ppb. A total of more than 40 hazardous chemicals have been identified at both sites by numerous sampling events.

No evidence was found that the Spring River was contaminated with dioxin. However, past analyses of fish taken from the river have shown dioxin levels as high as 52 parts per trillion (ppt), with averages ranging from 4.3 ppt in whole fish to 26 ppt in fillets. Results from recent samples indicate that levels of dioxin have been reduced in fish collected at designated sample stations. Because levels of dioxin were below or near 1 ppt in fish collected at downstream sampling stations, these points have been eliminated from the annual sampling program.

Groundwater sampling activities were conducted by Syntex, with oversight by the EPA and the Missouri Department of Natural Resources. Acetone, di-chlorobenzene, methylene chloride, and other volatile organic substances were detected in groundwater at the site. A risk assessment was prepared based on these results. Potential off-site groundwater contamination is a concern.

Review of the draft risk assessment submitted on behalf of the responsible party resulted in recommendations for further groundwater monitoring, including installation of a new background well and lower detection limits for dioxin. The old lagoon is no longer collecting stormwater runoff. Site owners reseeded the lagoon area. The majority of the site has a good stand of vegetation but with some bare spots. The facility is fenced and public access is restricted.

Remedial Actions at Site:

Syntex is completing the activities required under a consent agreement with the EPA. Parts of the properties contaminated with dioxin have been remediated. Due to the cleanup that has taken place, the EPA signed a Record of Decision for continued monitoring.

In 1980, Syntex submitted a Resource Conservation and Recovery Act (RCRA) Part A application for hazardous waste management operations, including a container storage area. The storage area was operated under interim status until November, 1994. At that time, the RCRA permit application was voluntarily withdrawn by Syntex. The container storage area was decontaminated, and soil around the area was tested to

determine if any hazardous constituents had been released.

Concentrations of mercury, lead and cadmium in the soil were found to be above background levels, but were less than health-based screening levels. Syntex was released from financial assurance requirements for closure on July 29, 1998.

Syntex remediated and excavated the lagoon. The EPA incinerated all the dioxin-contaminated soil from the lagoon area that exceeded 20 ppb. Syntex capped the lagoon and will maintain the vegetative cover.

Only the lagoon area was excavated. The irrigation area west of the photolysis area was filled and vegetative cover will be maintained. The burn area east of the Spring River was also filled and vegetative cover will be maintained.

The trench area, west of the Spring River, was remediated by constructing a clay cap to promote drainage away from the trenches. Topsoil was subsequently placed on the cap, and vegetative cover will be maintained. In addition, Syntex installed an upgradient gravel trench to divert stormwater away from the trenches. However, this area still contains drums that have not been sampled or characterized. In July 1996, Syntex abandoned some of the trench groundwater monitoring wells, and installed four new wells to replace the ones that have been historically dry. These wells were installed to monitor the drummed material in the trenches that may contain dioxin or other contaminants in excess of 20 ppb.

The slough area, a stormwater runoff area located north of the facility, was regraded and seeded to facilitate drainage. The spill area was capped with asphalt in October 1995. The remediated areas, excluding the trench area, do not contain levels of dioxin greater than 20 ppb. All of the capped areas are maintained by Syntex Agribusiness Inc. The contents of a storage tank that contained dioxin was removed and incinerated in the EPA Mobile Incinerator.

A concrete building was constructed north of the photolysis area and was used in the

cleaning and decontamination of equipment. This containment area was decontaminated and will be used by BCP Inc. in its manufacturing operations.

In April 1997, a trenching operation to bury elevated power lines uncovered an area of PCB contamination. Under a consent order with the EPA, Syntex excavated the contaminated soil and transported it to the APTUS incinerator in Coffeyville, Kansas. This action was completed in November 1997. A wastewater treatment unit is operating for the decontamination waters that continue to be generated from the remaining remediation activities.

Syntex sold an uncontaminated 80-acre tract west of the trenches. The company retained the required buffer area and established permanent survey markers around the site as required by Registry law. In August 1996, Syntex sold the plant to DuCoa. Syntex remains responsible for Comprehensive Environmental Response, Compensation and Liability Act cleanup activities. DuCoa subsequently sold the property to BCP Inc.

Syntex completed all remedial activities for Operable Unit 1. Operable Unit 1 involved disposing of dioxin-contaminated soil and sludge, and demolition or decontamination of buildings and equipment.

Syntex installed and is operating a monitoring system in Operable Unit 2 to monitor shallow groundwater. Thus far, dioxin has been detected in only two of the samples, but at very low levels that are not considered a health threat. The arsenic concentration in one well exceeded the drinking water standard, as did the chromium concentration in two others. These levels may be occurring naturally or may be analytical anomalies. Chlorobenzene was detected in several of the monitoring wells. This substance was also detected in previous sampling. However, contaminants are not known to be leaving the site. These contaminants were not contaminants of concern for the Operable Unit 1 remedial action.

All planned remedial construction has been completed, access to the site is restricted, and groundwater monitoring is being conducted.

General Geologic and Hydrologic Setting:

The Syntex Site is located on the Spring River flood plain, which contains numerous abandoned meanders. The meanders consist of gravelly materials, having a higher permeability than the surrounding materials. The Syntex plant sits atop an abandoned channel that was filled prior to plant construction.

Two bedrock aquifers are present at the site: the shallow Mississippian limestone aquifer and the deep aquifer made up of Cambrian- and Ordovician-age carbonates and sandstones.

The Mississippian aquifer is made up of cherty limestones that directly underlie the alluvium. This aquifer supplies limited yields to shallow wells used mostly by individual landowners in the general area. The Mississippian aquifer is subject to contamination from local sources, either through permeable soil and bedrock or through poorly-cased wells. At this site, the alluvial materials and the Mississippian bedrock are connected hydraulically.

The deep aquifer is used to supply major industrial and municipal users in the area. It is present typically at depths greater than 300 to 400 feet. In general, the Cambro-Ordovician aquifer in this region of the state has not been affected greatly by surface contamination; however, some localized pollution has resulted because of poorly-cased deep wells that penetrate both the upper and lower aquifers.

Public Drinking Water Advisory:

Syntex has purchased the former Well No. 3 of the Aurora-Verona water system, located at the northeast corner of the two sites, and it is now used only for fire protection. The nearest public well remains 2 miles east of the site. This is Well No. 4 of the Aurora-Verona water system. This well is cased to a depth of 421 feet and draws water from the Eminence Dolomite.

Although the well is primarily a standby unit, there is cause for concern due to its proximity to hazardous materials, the karst geology of the area, and the questionable integrity of the

well. The well has been sampled and no dioxin or other organic chemicals were found.

Health Assessment:

Dioxin is one of the most toxic substances known; however, its toxicity varies greatly between species. Animal studies have shown that dioxin produces acnegenic, fetotoxic, teratogenic, mutagenic, carcinogenic, and immunogenic effects. In humans, it is known to have an acnegenic effect (chloracne). It is suspected to cause soft tissue sarcomas, Hodgkin's disease, non-Hodgkin's Lymphoma, and porphyria cutanea tarda.

Hexachlorophene's principal effect is on the central nervous system, where it may cause paralysis, blindness and coma. It may also irritate the intestinal tract and can cause an allergic skin reaction. Hexachlorophene is not believed to be carcinogenic, but can cause birth defects.

Tetrachlorobenzene (chlorinated benzene) is irritating to the skin, conjunctiva and mucous membranes of the upper respiratory tract. Acute exposure may cause drowsiness, lack of coordination, and unconsciousness.

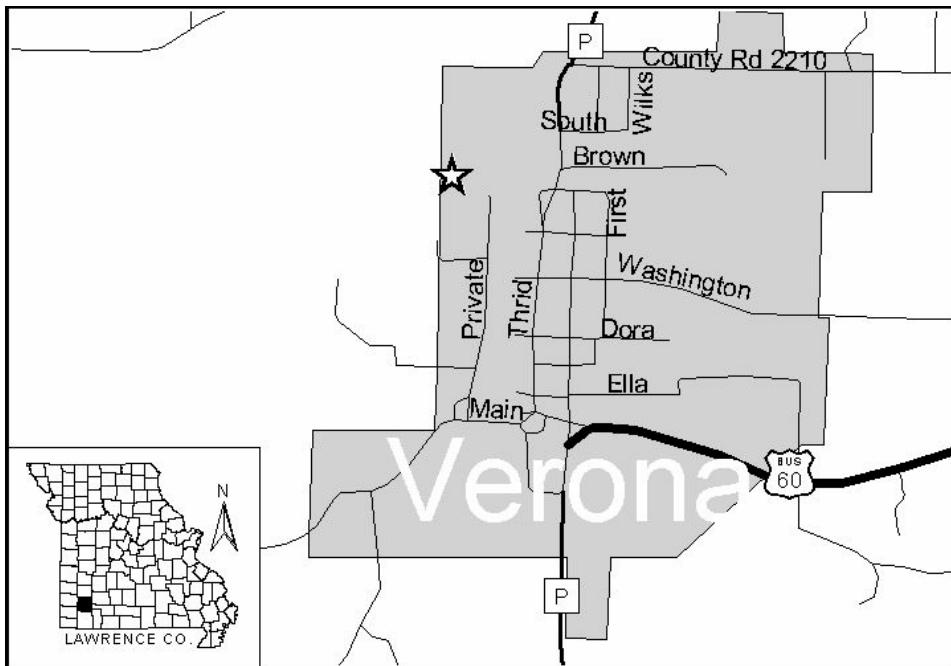
Acute poisoning with 2,4,5-trichlorophenol (TCP) produces decreased activity and causes motor weakness. Convulsive seizures can also occur. The 2,4,6-TCP isomer of the trichlorophenols is considered to be carcinogenic.

Routes of exposure include ingestion of contaminated water, direct exposure to the contaminated soil, or inhalation of contaminated dust. Access over land is limited, but the site is easily accessible via the Spring River. Fish are now considered safe to eat because recent sampling has shown that dioxin levels are no longer of health concern.

Based on available information, a threat to the public health exists. Remedial activities have lessened the human health risk from the site; however, the remaining dioxin is more soluble when mixed with organic chemicals and could still contaminate the groundwater.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Syntex - Verona (West)



Site Name: Syntex - Verona (West)

Classification: Class 3

Date of Placement: January 1, 1984

Address: First Street, Verona, Lawrence County, Missouri, SW 1/4, NE 1/4, Sec. 17, T. 26N, R. 26W, Verona Quadrangle

Present Property Owner: Syntex Agribusiness, Inc.

Lead Agency: EPA

Waste Type: 2,3,7,8-TCDD (dioxin)

Quantity: Not determined

Site Description:

The property is the former site of the Northeastern Pharmaceutical and Chemical Company (NEPACCO), whose chemical manufacturing processes are believed to have produced dioxin as an unwanted byproduct. Six distinct areas on the site have been found to be contaminated with dioxin.

In fiscal 2002, at the request of the site owners, this site was divided into two separate

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For remediation purposes, the two properties are still treated as one site. All activities conducted by the U.S. Environmental Protection Agency (EPA) and all activities related to National Priorities Listing remain unchanged. Therefore the information below, required by Hazardous Waste Management Law, is identical for both sites.

Environmental Problems and Areas of Concern Related to Site:

Sample analysis has documented hazardous chemicals including dioxin at 1,380 parts per billion (ppb), tetrachlorobenzene at 465 ppb, 2,4,5-trichlorophenol at 244,000 ppb, 2,4,6-trichlorophenol at 134,000 ppb, and hexachlorophene at 170,000 ppb. A total of more than 40 hazardous chemicals have been identified at both sites by numerous sampling events.

No evidence was found that the Spring River was contaminated with dioxin. However, past analyses of fish taken from the river have shown dioxin levels as high as 52 parts per trillion (ppt), with averages ranging from 4.3 ppt in whole fish to 26 ppt in fillets. Results from recent samples indicate that levels of dioxin have been reduced in fish collected at designated sample stations. Because levels of dioxin were below or near 1 ppt in fish collected at downstream sampling stations, these points have been eliminated from the annual sampling program.

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Review of the draft risk assessment submitted on behalf of the responsible party resulted in recommendations for further groundwater monitoring, including installation of a new background well and lower detection limits for dioxin. The old lagoon is no longer collecting stormwater runoff. Site owners reseeded the lagoon area. The majority of the site has a good stand of vegetation but with some bare spots. The facility is fenced and public access is restricted.

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All planned remedial construction has been completed, access to the site is restricted, and groundwater monitoring is being conducted.

Class 3 Sites

General Geologic and Hydrologic Setting:

The Syntex Site is located on the Spring River flood plain, which contains numerous abandoned meanders. The meanders consist of gravelly materials, having a higher permeability than the surrounding materials. The Syntex plant sits atop an abandoned channel that was filled prior to plant construction.

Two bedrock aquifers are present at the site: the shallow Mississippian limestone aquifer and the deep aquifer made up of Cambrian- and Ordovician-age carbonates and sandstones.

The Mississippian aquifer is made up of cherty limestones that directly underlie the alluvium. This aquifer supplies limited yields to shallow wells used mostly by individual landowners in the general area. The Mississippian aquifer is subject to contamination from local sources, either through permeable soil and bedrock or through poorly-cased wells. At this site, the alluvial materials and the Mississippian bedrock are connected hydraulically.

The deep aquifer is used to supply major industrial and municipal users in the area. It is present typically at depths greater than 300 to 400 feet. In general, the Cambro-Ordovician aquifer in this region of the state has not been affected greatly by surface contamination; however, some localized pollution has resulted because of poorly-cased deep wells that penetrate both the upper and lower aquifers.

Public Drinking Water Advisory:

Syntex has purchased the former Well No. 3 of the Aurora-Verona water system, located at the northeast corner of the two sites, and it is now used only for fire protection. The nearest public well remains 2 miles east of the site. This is Well No. 4 of the Aurora-Verona water system. This well is cased to a depth of 421 feet and draws water from the Eminence Dolomite.

Although the well is primarily a standby unit, there is cause for concern due to its proximity to hazardous materials, the karst geology of the area, and the questionable integrity of the

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Health Assessment:

Dioxin is one of the most toxic substances known; however, its toxicity varies greatly between species. Animal studies have shown that dioxin produces acnegenic, fetotoxic, teratogenic, mutagenic, carcinogenic, and immunogenic effects. In humans, it is known to have an acnegenic effect (chloracne). It is suspected to cause soft tissue sarcomas, Hodgkin's disease, non-Hodgkin's Lymphoma, and porphyria cutanea tarda.

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Tetrachlorobenzene (chlorinated benzene) is irritating to the skin, conjunctiva and mucous membranes of the upper respiratory tract. Acute exposure may cause drowsiness, lack of coordination, and unconsciousness.

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Routes of exposure include ingestion of contaminated water, direct exposure to the contaminated soil, or inhalation of contaminated dust. Access over land is limited, but the site is easily accessible via the Spring River. Fish are now considered safe to eat because recent sampling has shown that dioxin levels are no longer of health concern.

Based on available information, a threat to the public health exists. Remedial activities have lessened the human health risk from the site; however, the remaining dioxin is more soluble when mixed with organic chemicals and could still contaminate the groundwater.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Todd Site



Site Name: Todd Site

Classification: Class 3

Date of Placement: June 2, 1987

Address: North side of Lynch Street between 7th and 9th Streets, St. Louis, Missouri

Present Property Owner: Anheuser-Busch Companies, Inc.

Lead Agency: DNR

Waste Type: Stoddard solvent

Quantity: A total of 26 underground tanks and eight 55-gallon drums, containing 54,405 gallons of liquids and sludges and 4,236 cubic yards of contaminated soil, were removed from the site during remediation. Residual contamination of soil and groundwater has been documented.

Site Description:

The site is located in downtown St. Louis. A commercial laundry and dry-cleaning business was operated on the site until 1980. Stoddard solvent used in that business was stored in

underground tanks. Anheuser-Busch Companies Inc., purchased the property in 1980 and, in 1983, razed the buildings and paved the site for use as a parking lot.

Environmental Problems and Areas of Concern Related to Site:

Following remedial actions, residual contamination remains in the soil and groundwater. Contamination may potentially be migrating off site via groundwater. Groundwater in the area is not used for drinking.

Remedial Actions at Site:

Sampling and analyses of the underground tanks indicated the presence of Stoddard solvent, which possesses the characteristic of an ignitable hazardous waste. On October 7, 1983, five groundwater monitoring wells were installed. Analyses of groundwater samples collected from these wells showed the presence of Stoddard solvent downgradient from tanks at the west side of the site. This contaminant was not detected in groundwater samples collected upgradient from those tanks. On February 6, 1984, the Missouri Department of Natural Resources notified

Anheuser-Busch of its intention to include the Todd Site on the Registry. On March 2, 1984, Anheuser-Busch appealed the proposed Registry action.

On May 25, 1984, the department issued a "Notice of Order to Clean Up Hazardous Substance" (Order No. HC84-003) to Anheuser-Busch to implement a department-approved Remedial Action Plan (RAP). Implementation of the RAP occurred during August and September 1984. The RAP addressed three areas of the Todd Site.

Eighteen tanks and contaminated soil around these tanks were excavated from the west side (area 1) of the site. Two tanks were found to contain diesel oils and sludges, while the remaining tanks contained Stoddard solvent, sludge or contaminated soil. The liquid wastes contained in the eighteen tanks were shipped to an off-site hazardous waste landfill for solidification and land disposal. The tanks and about 4,236 cubic yards of contaminated soil were shipped off site for landfilling. Soil sample results from the excavated pit ranged between 20 and 11,000 parts per million (ppm) for Stoddard solvent. The excavation was filled with clean soil

The Todd building area (area 2), located at the corner of Lynch and 7th Streets, contained seven underground tanks. The liquid contents of these tanks (essentially Stoddard solvent) were shipped off-site for recycling. Sludge contained in the tanks was shipped to an off-site hazardous waste landfill for disposal. Five of the empty tanks were cleaned and filled with grout, while two tanks were excavated and shipped to a landfill.

The dry-cleaning area (area 3), immediately north of the Todd building, consisted of a sump containing gravel, solvents and water, and a large tank containing solvents and water. The tank was pumped out, cleaned and filled with sand. The solvents from the sump and tank were shipped off site for recycling, while the sludges were sent off site for disposal in a hazardous waste landfill. Eight 55-gallon drums of dry-cleaning sludges stored in this area were also shipped off site for landfill disposal.

Following these actions, samples collected from the five monitoring wells showed the presence of Stoddard solvent in downgradient wells at concentrations of up to 32.3 ppm. The recommended water cleanup level was 2.3 ppm. In addition, sample analyses confirmed the presence of a top layer of Stoddard solvent in a third monitoring well. A sample collected from this well on December 10, 1984, contained a layer of Stoddard solvent, with a 1,3,5-trimethylbenzene concentration of 10,000 ppm.

The five monitoring wells were sealed during construction of the parking lot on the west side. Two new groundwater monitoring wells were subsequently installed.

General Geologic and Hydrologic Setting:

The site is located on a moderate slope, which forms the western edge of the Mississippi River alluvial plain. The site is covered by fill material consisting of firm, brown, silty clay, intermixed with construction rubble. The fill, which is generally between 3.5 and 4.5 feet thick, is underlain by silty clay.

The bedrock unit beneath the site is Mississippian-age St. Louis Limestone, a medium- to massively- bedded, fine-grained limestone that is greater than 100 feet thick. The St. Louis Limestone contains well-developed karst features. Solutioning of fractures and bedding planes has rendered the bedrock highly permeable. Beneath the St. Louis Limestone is more than 700 feet of Mississippian, Silurian, and Devonian bedrock, predominantly limestone, which forms the uppermost bedrock aquifer. The Ordovician-age Maquoketa Shale separates the upper, freshwater aquifer from the saline water of deeper Ordovician and Cambrian formations.

Shallow soil-exploration borings drilled on the site indicate some free water at about 15 feet below the surface. This water is thought to be perched on top of one of the moderate- to low-permeability, silty, clay deposits. The direction of movement of the perched water is unknown.

The water table elevation at the site is also unknown, but is estimated to be 40 to 50 feet below the ground surface. The general direction of shallow groundwater movement is expected to be to the east toward the Mississippi River, which serves as a regional discharge point. The rate of groundwater movement is expected to be slow to moderate in the soil horizons and rapid in the bedrock.

Groundwater is not used generally as a water supply source in St. Louis because surface water supplies have been well-developed. However, wells are known to have been drilled in the downtown area and some of these may still be in use.

Public Drinking Water Advisory:

The area is served by the St. Louis City Water Department, which uses the Missouri and Mississippi Rivers as sources. The water intake on the Mississippi River is located upstream of the Todd Site. The site poses little threat to the public water supply.

Health Assessment:

The chemical composition of a typical Stoddard solvent is 30 to 50 percent paraffins,

30 to 40 percent cycloparaffins, and 10 to 20 percent aromatic hydrocarbons.

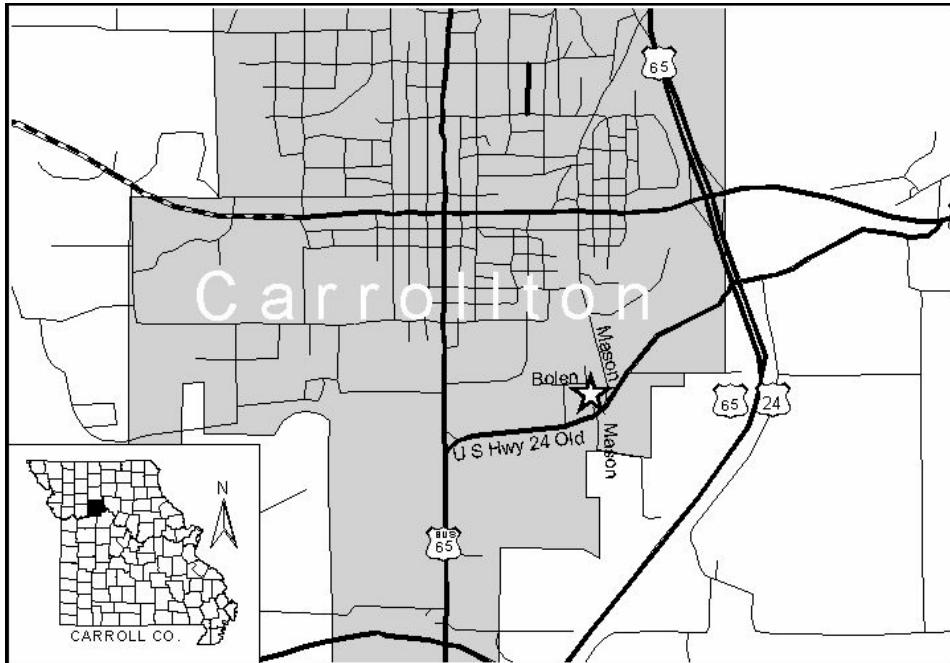
Overexposure to Stoddard solvent causes irritation of the eyes, nose and throat, and may cause dizziness, fatigue, and in extreme cases, unconsciousness and death. Dermal exposures to the solvent can cause skin irritation, dermatitis and jaundice.

At present, the risk to public health is minimal, as groundwater in this area is not known to be used for drinking purposes.

Based on available information, a potential health risk remains at the site due to the known concentrations of the contaminants in the soil and water. Current risks are low as long as the area is covered and the groundwater is not being used for drinking.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Turner Salvage



Site Name: Turner Salvage (formerly Tonnar Salvage)

Classification: Class 3

Date of Placement: May 16, 1997

Address: Hwy. 24/65, Carrollton, Carroll County, Missouri, SW 1/4, NW 1/4, Sec. 4, T. 52N, R. 23W, Carrollton East Quadrangle

Present Property Owners: Willis Turner

Lead Agency: EPA

Waste Type: Ignitable materials, volatile organic compounds (VOCs) (toluene, ethylbenzene, xylenes, 2-butanone, and benzene), trichlorethylene (TCE), and metals (chromium, lead, and beryllium). Oil, grease, PCB-containing transformers, and asbestos-containing materials are also present on site.

Quantity: Not determined

Site Description:

The former Tonnar Salvage Site, now operating under new ownership as Turner Scrap Metal, is an active recycling business located in a commercial and residential area

on the southeastern boundary of the city of Carrollton. Starting in 1957, the site was used as a drum recycling facility. Hundreds of containers were scattered about the site in a variety of sizes (1-, 3-, 5-, 15- and 55-gallon) and conditions (full, empty, bunged and unbunged).

After a fire at the site, Missouri Department of Natural Resources staff inspected and sampled the site.

This site is listed on the Comprehensive Environmental Response, Compensation, and Liability Information System (CERCLIS) as the Tonnar Salvage Site, and all remediation and U.S. Environmental Protection Agency (EPA) activities were conducted under that name.

Environmental Problems and Areas of Concern Related to Site:

The site is within the 10-year flood plain of the Missouri River. Shallow groundwater below the site and sediments immediately downstream of the site are contaminated with lead.

Residual soil contamination remains at several locations. The area is bounded on the south and east sides by Standley Branch

Creek, which discharges into Wakenda Creek 0.25 miles from the site. Wetlands are associated with both waterways.

The 2002 annual inspection report indicates that the site contains miscellaneous scrap metal of every description. Several piles of used tires are present. A moderate amount of metal has been salvaged or removed. A small amount of oil, staining an area of about 6 by 6 feet in size, has leaked from the east side of the baler.

Remedial Actions at Site:

In August 1996, based on a Pre-CERCLIS Site Screening, the department concluded that the site should be listed on CERCLIS. The department requested that the EPA evaluate the site for a time-critical removal action. The EPA completed a Removal Assessment of the site in December 1996.

The EPA conducted additional site investigation and sampling in January 1997. In November 1997, the EPA and Tonnar Salvage entered into an Administrative Order on Consent for removal action. In April 1998, the EPA approved Tonnar Salvage's workplans for the removal action.

Tonnar Salvage and its representatives conducted a Superfund removal action in December 1998. Containerized hazardous wastes and used oil originally identified at the site were removed and disposed off site during the removal action. The remains of containerized paint from the burned barn area were collected and containerized. These wastes were characterized as hazardous wastes based on the toxicity characteristic for lead. This waste was disposed off site at a hazardous waste facility and was the last of the containerized hazardous waste to be removed from the site during the removal action.

Isolated areas of contaminated soils that were identified for the removal action were excavated, with the resulting wastes being characterized and transported for disposal as nonhazardous wastes. These included the oil spill area south of the Tonnar Salvage Garage on the south side of the highway; lead contaminated soil near the burned barn; TCE-

contaminated soil south of Building C; and oil-contaminated soil near the metal compactor and baler. However, some areas of potential concern remain. These include the oil spill area south of the Tonnar Salvage Garage that continues to show elevated Total Petroleum Hydrocarbon levels, although it is apparently underlain by an asphalt surface; an area between Buildings A and B not addressed during the removal action where elevated beryllium levels were detected in department and EPA samples; apparently recent oil contamination in the area of the compactor and baler identified during the department's annual inspection; an area near the west edge of the site that is devoid of vegetation; and a former transformer processing area that EPA sampling determined contains PCBs.

Other nonhazardous solid wastes were removed from the site and disposed off site, including asbestos-containing materials, empty drums and containers, and other miscellaneous materials. Also removed from the site were three transformers, which were delivered to the city of Carrollton for reuse, and several compressed gas cylinders, which were to be reused or disposed as appropriate. A number of containers of asphalt sealer containing TCE were determined to be useable product and placed back into the facility's active inventory. Containers of useable oil and grease also remain on site.

Hazardous substances may remain on site. However, the department's Hazardous Waste Program completed an Expanded Site Investigation (ESI), which recommended no further remedial action at Tonnar Salvage for the following reasons: no evidence of contaminants affecting nearby drinking water wells exists; no evidence exists of contaminants migrating to nearby wetlands and fisheries; and site contamination is being addressed under a removal action. The shallow groundwater sample collected in the vicinity of the compactor and baler during an integrated Preliminary Assessment/Site Inspection contained 181 parts per billion lead, which exceeds the state water quality standard and the EPA Maximum Contaminant Level for lead. However, the ESI concluded no evidence of impact on drinking water wells exists.

In 2000, the EPA approved Tonnar's "Removal Compliance Report" documenting the removal action conducted under an Administrative Order on Consent. The EPA plans no further remedial or removal actions.

General Geologic and Hydrologic Setting:

The site is located on alluvium of the Missouri River floodplain. The 50- to 100-foot thick alluvium consists of low-permeability, fine-grained clay and silt at the surface, grading with depth to coarser sand and gravel units with high permeability. Sand units are encountered typically within 20 feet below grade, and the gravel seams are present nearer the alluvium/bedrock contact. Depth to the water table is about 15 feet. The alluvial aquifer, which is an important source of potable water for local inhabitants, is in direct hydraulic communication with the Missouri River.

Under normal flow conditions, groundwater beneath the site flows south to southeast toward the Missouri River, while surface water runoff enters the Standley Branch of Wakenda Creek, a stream located south of the facility. Wakenda Creek, a gaining stream, may also be in direct hydraulic communication with the Missouri River alluvial aquifer. The site is subject to occasional flooding from the creek and the river. Release of contaminants would readily affect the alluvial aquifer through direct infiltration.

The bedrock beneath the site is composed of Pennsylvanian-age limestones. Since the bedrock exhibits low permeability, release of contaminants would have minimal effect on the bedrock aquifer. Due to the mineralization of water within the bedrock, this aquifer is not used as a water source. Release of dense non-aqueous phase liquids would be expected to impact the base of the alluvial aquifer,

potentially migrating along the top of bedrock, which slopes toward the southeast.

Public Drinking Water Advisory:

Five wells serving the city of Carrollton are 1 mile west of the site, and a sixth well is 1.5 miles to the southwest. These wells are on the south side of Wakenda Creek and are between 60 and 120 feet deep. The effect of this site on the well field is unknown.

Health Assessment:

The primary contaminants of concern include chromium, beryllium, lead, TCE and xylene. Chromium and beryllium at high levels are known to cause cancer in humans. Lead has deleterious effects on nervous system development and function, especially those of children. TCE and xylene may attack the liver, kidney and gastrointestinal system.

A determination has been made that contaminants are not migrating to the municipal water supply. However, because of the uncontrolled nature of the wastes, this site may continue to present a public health threat. The site borders a stream, is near a wetland, and is in the Missouri River floodplain. Waste has been placed right up to the bank of the stream. Municipal wells are located within one mile. Also within a mile, a few unused private wells are present at unoccupied residences. The previous owners conducted illegal open burning as recently as 1996. As a result of these conditions, surface water, groundwater, air and direct contact are all potential exposure pathways.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

West Lake Landfill



Site Name: West Lake Landfill

Classification: Class 3

Date of Placement: February 22, 1985

Address: Bridgeton, St. Louis County, Missouri, between Old St. Charles Rock Road and St. Charles Rock Road east of Earth City, T. 46N, R. 5E, St. Charles Quadrangle

Present Property Owner: Rock Road Industries, Inc.

Lead Agency: EPA

Waste Type: Radionuclides and industrial wastes

Quantity: About 8,700 tons of uranium ore wastes and other industrial wastes.

Site Description:

This site consists of two defined radioactive fill deposits located within a 200-acre active landfill area. The site lies in the Missouri River floodplain in northwest St. Louis County. The southeastern portion of the fill area contains radioactive material buried at a depth of 3 to 5 feet and covers about 3 acres. The

northwestern portion of the fill area contains radioactive material at a depth of 2 to 15 feet and covers about 13 acres. The waste was deposited in these areas in 1973. The material had been stored by Cotter Corporation under a Nuclear Regulatory Commission license before being disposed in the landfill. Records indicate that about 8,700 tons of leached barium sulfate containing about seven tons of uranium were mixed with about 39,000 tons of topsoil and taken to the landfill. A cyclone fence with four strands of barbed wire has been erected to restrict access to the site.

Deed restrictions have been placed on the entire West Lake Landfill Site to prevent residential development or groundwater use from occurring at the landfill. Additional deed restrictions have been placed on the radiologically impacted areas to prevent construction of buildings or utility excavations.

Environmental Problems and Areas of Concern Related to Site:

Uranium attributable to these buried deposits has been detected in groundwater monitoring wells. Groundwater at this location is very shallow. The alluvium underlying the river is one of the most important aquifers in the

state. Consequently, if contamination is occurring from the landfill, it is threatening the Missouri River alluvial aquifer, a vital aquifer resource.

The annual inspection report noted that the northeast section had ponded water near the St. Charles Rock Road. The southwest section has subsided areas that have been ponded in the past. This could result in the percolation of stormwater into the fill and the subsequent generation of leachate and possible groundwater and surface water contamination. Also, several piles of soil borings were uncovered and should be covered with tarps.

Remedial Actions at Site:

The site was surveyed prior to expansion in order to separate the other landfill areas from the area identified as containing hazardous radioactive materials.

The property owner conducted a hydrogeological study in 1986. Sampling of monitoring wells conducted during this investigation detected contaminants in the groundwater beneath the site. Samples taken in these monitoring wells revealed levels of uranium in excess of the EPA drinking water standard, the Maximum Contaminant Level for gross alpha activity.

The site was placed on the EPA's National Priorities List on October 26, 1989, mandating that the EPA conduct response actions at the site. After negotiating with the Potentially Responsible Parties (PRPs), an Administrative Order on Consent (AOC) was signed in March 1993 to conduct a Remedial Investigation/Feasibility Study (RI/FS) of the radiologically contaminated portions of the landfill (Operable Unit 1). The responding PRPs include Cotter Corporation, Laidlaw Waste Systems Inc., Rock Road Industries Inc., and the U.S. Department of Energy. A second AOC to perform an RI/FS for the non-radiological hazardous waste portions of the landfill (Operable Unit 2) was negotiated by Laidlaw Waste Systems and the EPA and executed in December 1994.

A draft RI report and risk assessment has been completed for Operable Unit 1. The RI

report revealed that radionuclides are present in a dispersed manner throughout the upper part of the landfill deposits. It has also been concluded that erosion of surface soil and subsequent sediment transport has resulted in off-site migration of radionuclides from Areas 1 and 2. However, the levels of radionuclides detected in groundwater beneath and adjacent to Areas 1 and 2 generally were below the background levels, as presented in the report.

A draft Feasibility Study (FS) evaluating potential remedial alternatives for Operable Unit 2 has been prepared. Following approval of the FS, a proposed plan will be prepared by the EPA and presented to the public for comment. A remedy will then be selected and documented in a Record of Decision (ROD).

A draft RI report for Operable Unit 2 has been completed. Following approval of the RI report, an FS will be conducted to evaluate remedial alternatives for the non-radiological portions of the site.

General Geologic and Hydrologic Setting:

The landfill has existed for more than 20 years. For most of that time, landfilling occurred on the Missouri River flood plain. However, landfilling also took place in a limestone quarry adjoining the flood plain landfill. The quarry is in the St. Louis Limestone, which crops out along the eastern slopes of the Missouri River flood plain.

The initial landfill operation included excavation and filling within the flood plain. Fill material was placed in the saturated portion of the Missouri River aquifer. Subsequent landfill operations generally were confined to filling on top of the flood plain surface and in the adjoining limestone quarry.

The Missouri River alluvium consists of 15 to 20 feet of silt loam to very silty clay, with moderate permeability. The groundwater table occurs at depths of 15 to 20 feet below flood plain level. Fluctuations of 5 to 15 feet occur when prolonged wet seasons affect the level of the Missouri River.

Beneath the very silty clay, the Missouri River alluvial sediments are characterized by a

general increase in grain size associated with increasing depth. Sand becomes noticeable at depths of 20 to 30 feet, with gravel beginning to occur at depths of 30 to 40 feet.

The Missouri River alluvium is an important aquifer. Consequently, if contamination is migrating from the landfill, it is threatening a vital aquifer resource.

Public Drinking Water Advisory:

No public water systems are located in the immediate vicinity of West Lake Landfill. However, the site is less than 1 mile from the Missouri River, which is the water source for St. Louis County Water Company's North Plant. The intake for that plant is about 8 miles downstream from West Lake Landfill. Should contamination from the site reach the Missouri River, the downstream public water system could be affected.

Private wells located near the landfill may also be susceptible to contamination.

Health Assessment:

Uranium can cause adverse health effects in two ways: (1) toxic chemical effects, which

include damage to the kidney and liver, pneumoconiosis, pronounced changes in the blood, and generalized injury; and (2) radiation effects, which include lung cancer, osteosarcoma, and lymphoma.

The Missouri Department of Health and Senior Services completed an exposure assessment, which included a well survey, water sampling, and a health questionnaire for the site. Tests of the water from these wells did not show any contamination. Results of the questionnaire did not reveal any pattern of adverse health effects consistent with the hazardous materials landfilled at the site. The wells that were tested are no longer in use.

Based on available information, a potential health threat exists from the low-level uranium wastes at the site. While there is no evidence of past or present exposure, the potential for future exposure exists based on the possibility that off-site migration might occur.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

CLASS 4 SITES



Site Name: ACF (American Car Foundry)

Classification: Class 4

Date of Placement: February 22, 1985

Address: Dorcas and Second Street (2800 DeKalb Street), St. Louis, Missouri, a portion of City Block 769, St. Louis, Missouri

Present Property Owner: Anheuser-Busch Companies

Lead Agency: DNR

Waste Type: Volatile organic compounds

Quantity: At the time of identification, an estimated 12,230 gallons of solvent had been spilled over a 36-year period. Following remediation, residual contamination remained in the soil subsurface and shallow groundwater.

Site Description:

The site was once a railroad car manufacturing facility where solvents were spilled while cleaning paint from stencils. An estimated 12,230 gallons of solvents were inadvertently spilled on the ground over the

lifetime of this operation. Today, the site is covered by an asphalt parking lot.

The site is in an industrially zoned area of St. Louis. Although the site is fenced, it is accessible to the public via a roadway. The nearest off-site building lies 300 feet to the west. About 18 industrial buildings are located within 1,000 feet of the stencil cleaning area.

Environmental Problems and Areas of Concern Related to Site:

Following remedial actions at the site, residual levels of contamination remain in the soil subsurface and shallow groundwater. Contamination had migrated through the soil into the groundwater prior to the cleanup.

The site is located in the recharge area of the Mississippi River, which is 0.25 miles to the east. Groundwater in this area is not used for drinking water or agricultural purposes, but groundwater movement is toward the Mississippi River. While St. Louis obtains its drinking water from the Mississippi River upstream from the ACF Site, other towns downstream do use the river as a water source.

Remedial Action at the Site:

The site was identified in 1981 as the result of a Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) notification. An estimated 12,230 gallons of solvent had been spilled from 1945 to 1981 at an area used to clean paint from stencils. In 1983, Rollins Environmental Services Inc., was retained by ACF Industries Inc., the previous site owner, to assist in the assessment and cleanup of the stencil-cleaning area. The field assessment was conducted from September 19 to 21, 1983, and Rollins recommended removal of the contaminated soil.

On February 17, 1984, the Missouri Department of Natural Resources received a remedial action plan for site cleanup that the department approved on March 21, 1984. The closure plan was implemented in March 1984 to remediate the site. A total of 1,530 cubic yards of contaminated material was removed from the site which removed an estimated 90 to 95 per cent of the solvents. The excavation was backfilled with clay, which covered up the remaining contaminated soil. Backfilling of the excavation was completed by April 27, 1984. As excavated sections were closed, samples were collected. After final closure, analytical results showed residual levels of solvents still present in the soil subsurface and in the shallow groundwater. The remediation report prepared by Rollins concluded that the cost of removing the residual contamination was economically prohibitive.

In 1985, ACF transferred the property title to Yellow Freight Systems Inc., of Delaware.

On April 9, 1987, the department approved a request by Yellow Freight for the demolition of structures on the property and pavement of portions of the property. No excavation was planned for the contaminated area of the property. The company also re-surveyed the property to accurately designate the contaminated area. In January 1991, an "Affidavit of Release" was filed by the department with the St. Louis City Recorder's Office, releasing all property not designated as part of the contaminated area. The department verified that appropriate survey

markers were installed and in place, designating the contaminated property and the appropriate 100-foot buffer zone.

Anheuser-Busch Companies (ABC) purchased the site from Yellow Freight Systems Inc. ABC enrolled the site in the department's Voluntary Cleanup Program in March 1999. ABC performed soil and groundwater investigations and limited response actions under VCP oversight. A previously undiscovered underground solvent storage tank was removed, and a soil and asphalt cap was placed over the contaminated area. Residual solvent contamination of subsurface soil and shallow groundwater remains at the site. ABC has placed a restrictive covenant in the property chain of title restricting use of the property to industrial uses and requiring maintenance of the cap. The VCP issued a Certification of Completion in February 2001.

General Geologic and Hydrologic Setting:

The site is located on the Mississippi River flood plain 0.25 miles from the Mississippi River.

Soils are composed of artificial fill and alluvium. The alluvium at the surface is generally composed of fine-grained clay and silt. Coarse-grained alluvium, composed principally of sand, is expected at depth. The water table is relatively shallow (10 to 20 feet), but varies somewhat with river stage.

Because the spill area is located in an industrialized area downstream from the railroad terminal, it is possible that contaminants unrelated to this particular spill are present in the groundwater at the site. Materials that have remained following cleanup activities at this site will eventually migrate through the alluvium into the Mississippi River. The rate of movement of contaminants through the shallow groundwater system is expected to be relatively low, and a number of years may pass before the plume reaches the river.

Public Drinking Water Advisory:

The city of St. Louis has two water plants with intakes on the Missouri and the Mississippi

Rivers. The ACF Site is 0.25 miles from the Mississippi River, but is downstream of the city's intake structure. The site poses no threat to the public water system.

Health Assessment:

Trichloroethylene (TCE), tetrachloroethylene, methylene chloride, dichloroethene, benzene, toluene, and xylene were present in groundwater and soil samples collected from the site.

Remedial action reduced the concentrations of the contaminants in the soil to levels below risk-based limits with the exception of trichloroethylene (TCE).

The potential risks to health at this site are associated with exposure to the contaminated soil and the shallow groundwater. Thus, any future soil disturbance or any future use of the shallow groundwater would provide a route for human exposure. Present risks are low

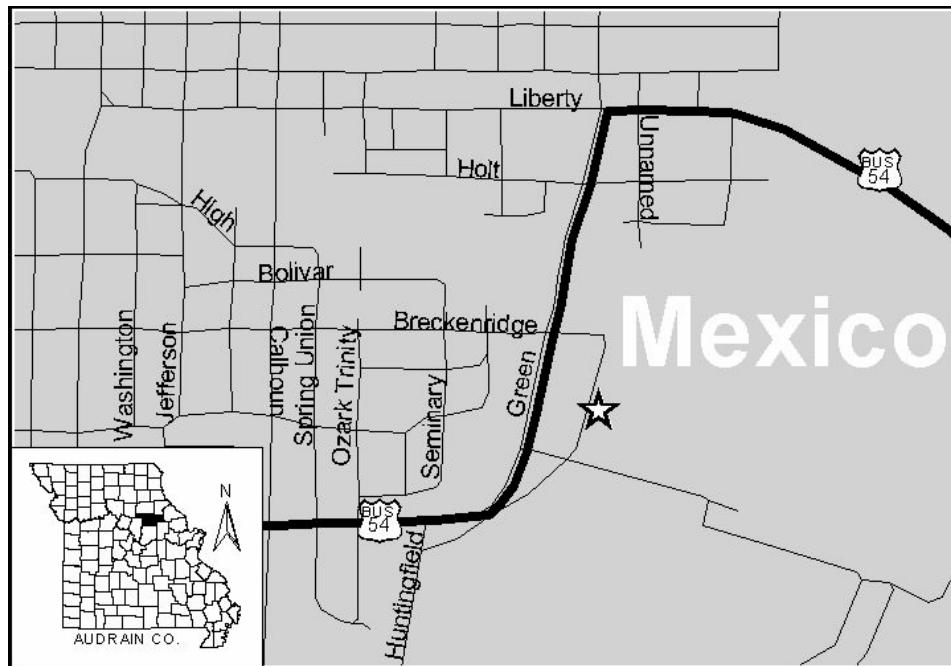
because the area is covered and fenced, and the contaminated groundwater has not been found to be a part of any aquifer used for drinking water

The site is located within census tract 1235. Since no people live within this census tract, no morbidity, mortality or natality data exist for this site.

Based on the available information, the soil and groundwater at this site still contain contaminants at levels that could cause adverse health effects. The contaminants do not pose a current health risk as they are not accessible by the public. As long as the restrictive covenant on the site is honored, the site should not present a public health risk.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

A. P. Green



Site Name: A. P. Green

Classification: Class 4

Date of Placement: June 14, 1984

Address: Green Boulevard, Mexico, Audrain County, Missouri, Vandalia Quadrangle. The site is made up of six individual waste dumps with the following descriptions of location:

- (1) Waste Dump No. 2, SW 1/4, SE 1/4, Sec. 31, T. 51N, R. 8W;
- (2) Waste Dump No. 4, SW 1/4, SE 1/4, Sec. 31, T. 51N, R. 8W and portions of NW 1/4, NE 1/4, Sec. 6, T. 50N, R. 8W;
- (3) Dynamite Dump No. 5, N 1/2, NE 1/4, Sec. 6, T. 50N, R. 8W;
- (4) Waste Dump No. 6, NE 1/4, NW 1/4, Sec. 6, T. 50N, R. 8W;
- (5) Waste Dump No. 7, SE 1/4, NW 1/4, and portions of the SW 1/4, NE 1/4, portions of NW 1/4, SE 1/4, and portions of NE 1/4, SW 1/4, Sec. 6, T. 50N, R. 8W; and
- (6) Waste Dump No. 8, NW 1/4, SW 1/4, Sec. 31, T. 51N, R. 8W.

Present Property Owner: A.P. Green, a subsidiary of Global Industries Technologies, Inc.

Lead Agency: DNR

Waste Type: Dynamite and heat treating (cyanide) compounds

Quantity: Estimated 5,000 pounds of dynamite and undetermined quantity of cyanide compounds.

Site Description:

The A.P. Green Refractories Site is located off Green Boulevard in the southwest part of Mexico, Missouri. It consists of six separate clay pits encompassing nearly 14 acres. These pits were dug originally to provide raw material for the production of refractory products. Records indicate that since 1954, these pits were used for disposal of wastes. Heat treatment wastes, possibly containing cyanide and totaling about 150 gallons, were deposited in five of the six pits. About 5,000 pounds of trinitrotoluene (TNT) was deposited in the sixth pit. One of the six pits (WD-7) is part of a permitted demolition landfill. Pit WD-1 was reported to contain metal piping once used for acid transfer, and pit WD-3 contains

asbestos. However, these two pits are not included in the area that is listed on the Registry.

The closest residential area is 1.25 miles from the site. The nearest commercial or industrial area is 0.5 miles. A publicly traveled area is 1,500 feet away, and a public use area is 2 miles from the site.

Farmland surrounds the six hazardous waste disposal sites. The loss of control of the farmland surrounding the hazardous waste disposal sites would compromise security and access to the sites. Construction of a bypass for Highway 54 was completed in fiscal 1995. The bypass is located southeast of waste dumps Nos. 5 and 7.

Access to the site is restricted, as the property is fenced and posted with warning signs. The guardhouse at the site entrance is currently unmanned.

Environmental Problems and Areas of Concern Related to Site:

Buried dynamite is the primary concern at this site. The dynamite is a nitro-based material. Since the dynamite was buried in clay pits, water infiltration may potentially have caused nitro pools. Water tends to pond in the clay pits, increasing the likelihood of water moving through the landfilled material. The stability or explosive life of the buried dynamite is unknown. Worker injury, fire or explosion could occur if someone tries to unearth the material. Numerous ponds and streams are in the area. The site is well to sparsely vegetated with some minor erosion.

Remedial Actions at Site:

Following Registry notification, the property owner submitted a legal survey to reduce the size of the property appearing on the Registry. Permanent survey markers were installed at the corners of the six contaminated pits, including a 100-foot buffer zone in all directions. Each site is marked and signs were placed to indicate that hazardous waste is buried there.

The Missouri Department of Natural Resources concluded a Site Investigation (SI)

in 1991. The SI concluded there appears to be little risk unless the buried waste is disturbed. The buried hazardous substances are stable and apparently not migrating.

The SI concluded the individual sites should continue to be monitored, maintained and undisturbed.

General Geologic and Hydrologic Setting:

The sites are located in an upland setting. Glacial till, about 100 feet in thickness, overlies Pennsylvanian-age bedrock. Both the surficial material and the bedrock are characterized by low permeability.

Shallow groundwater is present in the glacial till; however, yields are generally low. The approximate location of the water table is at the contact between the surficial material and the bedrock. Groundwater found at this depth is normally highly mineralized and does not meet drinking water standards.

Due to the low permeability of the surficial material, numerous ponds are in the area. In addition, clay pits in the area retain water, creating artificial ponds. Streams in this region tend to be gaining.

Groundwater supplies are not anticipated to be significantly affected by site contamination. However, surface water may be affected by leakage reaching the Long Branch Creek to the east, or South Fork of the Salt River to the west.

Public Drinking Water Advisory:

City wells penetrating consolidated formations are located 1 to 3 miles from the site. The site poses no threat to the public water system.

Health Assessment:

The individual pits composing this site are restricted from public use, and the materials are buried at depths from 6 to 40 feet. Department personnel have concluded that because of the massive deposits of clay surrounding and underlying the site, the potential for off-site migration of the chemicals through groundwater movement is very small. Therefore, the only likely route of exposure to

these chemicals appears to be if excavation were to occur. This could result in illness through inhalation, ingestion or cutaneous absorption.

Cyanide has been shown to cause weakness, headaches, confusion, nausea, vomiting, eye and skin irritation, and respiratory effects. TNT is a Class A explosive that may cause irritation of the eyes, nose and throat. Upon detonation, it may cause damage and death to anyone in the area. Asbestos can induce severe respiratory system damage including lung cancer and mesothelioma.

An exposure investigation conducted by the Missouri Department of Health and Senior Services (DHSS) found no evidence of current

human exposure to contaminants from the site.

Based on the information available, the DHSS has determined that this site does not currently pose a health hazard to the general population. Similarly, workers and trespassers on the site should not be at risk provided the waste materials are not carelessly disturbed.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.



Site Name: ARMCO

Classification: Class 4

Date of Placement: January 1, 1984

Address: 7000 Winner Road, Kansas City, Jackson County, Missouri, Portions of SW 1/4, Sec. 29; NW 1/4, Sec. 32; and NE 1/4, Sec. 31, all in T. 50N, R. 32W, Independence Quadrangle

Present Property Owner: AK Asset Management Company owns the property included on the Registry. GS Technologies Operating Company, Inc. (GST) owns adjacent property which, when combined with the AK Asset Management Company property, composes the ARMCO facility under RCRA.

Lead Agency: DNR and EPA

Waste Type: Lead, cadmium and zinc in the Registry areas. Arsenic, cadmium, lead, volatile organic compounds and semi-volatile organic compounds in areas of the RCRA site not listed on the Registry.

Quantity: About 27,000 tons in the Registry areas. Not determined in non-Registry areas.

Site Description:

The ARMCO complex is an active steel manufacturing plant. From 1962 to 1980, ARMCO used two landfills located on its property for the disposal of electric furnace baghouse dust generated from steel production processes. Baghouse dust generated by ARMCO was found to contain leachable quantities of lead and cadmium. This dust also contains a high concentration of zinc (10-12 percent). After 1980, this waste became regulated by the Resource Conservation and Recovery Act (RCRA). These two fill areas are listed on the Registry.

This site is located in an industrial area of Kansas City. The site is accessible by water by way of the Big Blue and Missouri Rivers. Access to the site is restricted by fencing and a locked gate except via the Blue River.

Environmental Problems and Areas of Concern Related to Site:

For the areas listed on the Registry, no environmental problems are known at the present time. However, the potential exists for surface and groundwater contamination from the two landfills due to the leachable nature of the wastes. Both landfills were impacted by

the 1993 flood; however, the landfill caps did not erode.

Groundwater at the site is used only for monitoring, and is not anticipated to be used by the facility in the future. Seventeen industrial process or potable supply wells exist within a three-mile radius of the RCRA landfill located on site. The current status of these wells is unknown.

A proposed route for construction of the South Riverfront Expressway may transect a portion of the property currently listed on the Registry. The Missouri Department of Natural Resources is continuing to work with stakeholders on this project to address any potential human health or environmental impacts associated with the planned expressway development.

Remedial Actions at Site:

The landfill areas are currently capped with about 3 feet of dirt. A good vegetative cover was established for both landfills.

The RCRA landfill is currently permitted by the department. Site-wide corrective action is being addressed pursuant to an EPA-issued Hazardous and Solid Waste Amendments (HSWA) permit with the department acting as technical lead. Twenty-nine Solid Waste Management Units (SWMU) and Areas of Concern (AOC) have historically been identified for further investigation. Seventeen of these are located on both AK Asset Management Company and GST property.

Interim measures were conducted by AK Asset Management Company to address certain known areas of contamination. A RCRA Facility Investigation (RFI) was conducted to assess potential releases to the environment from the SWMUs and AOCs at the facility. A Corrective Measures Study Work Plan is currently under development to assess remedial alternatives at six SWMUs and one AOC.

On February 2, 2000, an "Affidavit of Release" was filed with the Jackson County Recorder of Deeds, releasing a very small, uncontaminated portion of the site owned by the Kansas City Terminal Railway Company.

General Geologic and Hydrologic Setting:

Surface soils are composed primarily of low-permeability, alluvial, silty clay, underlain by alluvial silt and sand, which has moderate permeability. Wastes were reportedly deposited in permeable materials within an abandoned meander of the Big Blue River at or below the water table.

The silty, clay material present at the surface forms a relatively impermeable barrier to the downward movement of surface contaminants. Wastes deposited in the silt and sand material, however, are anticipated to affect shallow groundwater in the vicinity of the site. Surface migration of contaminants could also occur during heavy flooding.

Depth to the water table ranges from 10 to 20 feet. Groundwater is expected to flow toward the Big Blue and Missouri Rivers; consequently, contaminants that enter groundwater supplies are anticipated to resurface at either the Missouri River or Big Blue River. No known drinking water wells are producing from the alluvial aquifer in the projected area of potential groundwater contamination.

Bedrock, which is present at depths of 70 to 100 feet, does not affect the site's groundwater contamination potential.

Public Drinking Water Advisory:

The site is located near the bank of the Big Blue River, about 3 miles above its confluence with the Missouri River (River Mile 356.8), and poses little threat to downstream public water systems.

Health Assessment:

Exposure to lead causes fatigue, headache, aching bones and muscles, constipation, decreased appetite, and anemia. Chronic exposure may cause irreversible central nervous system and kidney damage.

Exposure to cadmium may cause damage to the respiratory tract, kidney, and liver. There is also evidence that cadmium and lead may be carcinogenic to humans. Adverse effects following ingestion of zinc are only associated

with high doses and include gastrointestinal distress, nausea and vomiting.

The only release of contaminants from the site appears to be via surface runoff into the Blue River. The U.S. Geological Survey and the department conducted a study of stormwater runoff in the Blue River basin. This study revealed that immediately following rainstorms in the lower Blue River basin, the level of zinc doubled between the upstream and downstream sampling points from ARMCO. This study also showed smaller increases in the lead concentration in the river at the downstream sampling site.

The study population for this site is the residents within the zip code 64125. Cancer deaths for years 1983 to 1993 for the study population were compared to statewide cancer deaths. The observed number of deaths for total cancer was significantly higher than expected. Age-specific cancer rates, which were also significantly higher than expected, include, brain, Hodgkin's Lymphoma, kidney, lung, and pancreas. In the 15 to 44 age group, "other cancer" was significantly higher than expected. In the 45 to 64 age group, kidney and total cancer were significantly higher than expected. In the 65+ age group, brain, Hodgkin's Lymphoma, lung, pancreas, and total cancers were significantly higher than expected. Two natality studies

(1980 to 1989 and 1990 to 1994), found no rates significantly different than state averages.

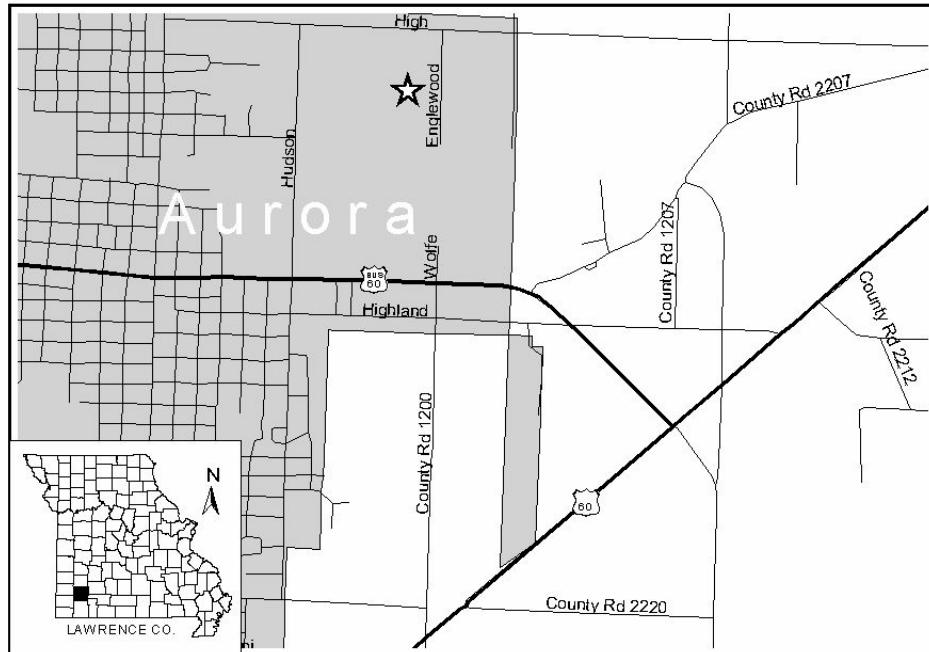
An exposure investigation conducted by Missouri Department of Health and Senior Services personnel failed to document any significant human exposure from this site. The great majority of the zinc and lead in the Blue River following heavy rainfall events are suspended solids that are present in high concentrations in the river water only immediately following erosion caused by stormwater runoff. As the suspended solids settle out, lead and zinc are deposited in sediment and are potentially available to bioaccumulate in fish and other aquatic organisms.

The landfills are located well away from most remaining plant activity and are surrounded by the large ARMCO/GST properties, which act as a buffer between the waste and off-site areas.

Based on available data, a health threat exists at this site.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Baldwin Park



Site Name: Baldwin Park

Classification: Class 4

Date of Placement: September 23, 1986

Address: Baldwin Park is located on High Street in the extreme northeast corner of the town of Aurora, Lawrence County, Missouri, NE 1/4, Sec. 7, T. 26N, R. 25W, Aurora Quadrangle

Present Property Owner: City of Aurora

Lead Agency: EPA

Waste Type: 2,3,7,8-TCDD (dioxin), 2,4,5-Trichlorophenoxyacetic acid (2,4,5-T), hexachlorophene, and lead

Quantity: Not determined

Site Description:

The site is now the location of a municipal park. The area was once strip mined for lead ore. When mining operations ceased, the pits were used as a dump for municipal trash from the city of Aurora and surrounding communities. Reports indicate that sometime in the mid-1960's, dioxin-contaminated

wastes, generated by Hoffman-Taff Corporation, were buried at the site. Later sampling substantiated these reports. The dump was closed and capped in the 1970's, and the area was converted into a park.

Following a request by the city of Aurora to reduce the area listed on the Registry, additional sampling was conducted on July 25, 1996, in order to delineate the area of contamination. Dioxin was not detected in the northern and northeastern areas of the park. The area on the Registry was reduced to include only 60 acres in the southwestern area of the park.

Environmental Problems and Areas of Concern Related to Site:

The site was partially cleaned up and properly capped and vegetated with the oversight of the Missouri Department of Natural Resources and the EPA. In 1987, the most heavily contaminated areas were cleaned up to a dioxin level of 20 parts per billion (ppb) or less and capped. The capped areas should be maintained in order to prevent erosion and human exposure. Two of the capped areas are not fenced, and no warning signs are posted. The remaining capped areas are located within the gun club area in the

southwest corner of the park, which is fenced. Ball fields are located on the northwest side of the Registry site and additional development may be planned by the city of Aurora.

Remedial Actions at Site:

Baldwin Park was first investigated in October 1983. Sampling began in October 1984. Sample results indicated the presence of dioxin in concentrations ranging from 2.7 ppb to 743 ppb. The highest concentrations were detected in discrete samples collected from exposed bags and drums. A more extensive sampling program was conducted in November 1984 to determine the extent of contamination. In April 1986, 30 piezometers and eight monitoring wells were installed. The groundwater was determined to flow to the west-southwest at a rate of 1 foot per year.

In winter 1987, EPA contractors excavated and removed about 250 yards of soil that exceeded 20 ppb dioxin. Excavated soil was transported to the EPA mobile incinerator in Verona. The excavated areas and areas showing dioxin surface contamination between 1 and 20 ppb were properly covered and capped. The cap consists of 6 inches of sand; a brightly-colored Visqueen liner that serves as an indicator if the cover is compromised; another 6 inches of sand; and 6 inches of topsoil. The topsoil was seeded and covered with a biodegradable erosion control mat to prevent erosion before the grass has a chance to grow and spread. To assure that contaminated groundwater is not migrating off site, the EPA performed groundwater monitoring for a one-year period. The city of Aurora has agreed to provide maintenance and prevent excavation of the cover.

The city of Aurora requested approval from the department for a proposed sewer expansion project during fiscal 2000. The area of proposed excavation appeared to be free from contamination according to past site sampling and cleanup information. The city conducted a geophysical survey of the area that indicated no obstacles, and the sewer project was completed in the spring of 2000 with no apparent problems.

During the fall of 2001, the department conducted a Combined Preliminary

Assessment/Site Investigation of the Lawrence County Mining Site, which revealed elevated levels of lead in several residential yards in the city of Aurora. As a result, the EPA is conducting a Removal Action in the area and will excavate about 5000 to 8000 cubic yards of soil from residential yards.

During fiscal 2002, the department approved the use the Baldwin Park Site as a repository for lead-contaminated soils excavated during the Lawrence County Removal Action. The lead-contaminated soils will be used in the construction of a berm, adjacent to the Gun Club on site, to reduce noise levels and shot hazards inherent with the club area's usage. Surface soil in the proposed area contains lead at concentrations above the EPA's residential action level of 400 ppm. The lead-contaminated soils will be placed at the bottom of the berm structure, covered with at least 1 foot of clean fill, and hydro-seeded to eliminate soil erosion of the cap and potential exposure to highly-contaminated soils. The completed berm will be maintained by the city of Aurora. The current fence will be moved to restrict access to the berm. Excavation of soils and construction of the berm began in July 2002.

General Geologic and Hydrologic Setting:

The Baldwin Park Site is located on a broad, upland area characterized by very gentle slopes. The site straddles the drainage divide between the west-flowing Chat Creek and the north-flowing Elm Branch of Honey Creek.

Historically, this area has undergone some radical land-use changes that have altered the site's natural features. The area near the railroad tracks reportedly was swampy at one time. However, as the area was settled, it was drained and converted to an apple orchard. In 1886, lead ore deposits were discovered, and subsequent surface and underground mining drastically altered the topography. The mining, which ceased in 1955, resulted in open shafts, pits, mill works and tailings piles. Many of the mined areas have since been reclaimed. Baldwin Park was developed sometime after 1973; thereafter, a portion of it was used as a city trash dump. Shafts were reportedly filled with tailings and in some cases with trash. Some

of the remaining open shafts and pits are now filled with water.

Exposures in mine shafts reveal about 20 feet of residuum derived from the weathering of underlying bedrock. The residuum is composed of reddish-brown, cherty, silty clay. Typically, this material develops a very blocky structure and exhibits high permeability. However, the residuum at the site seems to be atypical, as evidenced by the historically high water levels and swampy conditions.

The bedrock surface is uneven. The uppermost bedrock at the site is the Mississippian-age Burlington-Keokuk Limestone, except in the southern part of the park, where a relatively thin layer of sandstone, shales, conglomerates, and limestone cover the Burlington-Keokuk in some locations. The Burlington-Keokuk, along with underlying Mississippian-age cherty limestones, makes up the shallow aquifer in this area. This aquifer is over 350 feet thick and is used extensively for individual rural water supplies.

A confining layer separates the shallow aquifer from the deeper Cambrian- and Ordovician-age carbonates and sandstones that make up the deep aquifer. The deep aquifer is about 1,800 feet thick. Very high yields may be obtained from this aquifer. As a result, it provides public water supplies for the area.

Both Chat Creek and Elm Branch are gaining streams near the site but lose water to the subsurface downgradient of the site. The lost water recharges the shallow aquifer, and some of it is later discharged from springs. Water tracing studies have shown that water lost to the subsurface in the Honey Creek drainage emerges at Big Spring near the mouth of Williams Creek.

Public Drinking Water Advisory:

Baldwin Park is about 1 mile from the nearest Aurora city well. The city wells are greater than 1,000 feet in depth, each with 300 to 700 feet of casing. They draw water from the Eminence Dolomite and should not be

affected by contamination from the site. The Sunset Drive-In has a well 0.9 miles south of the site. This well is only 665 feet deep, with 165 feet of casing, making it more susceptible to contamination. It draws water from the Jefferson City Dolomite.

Health Assessment:

Dioxin is one of the most toxic substances known; however, its toxicity varies greatly between species. Animal studies have shown that dioxin produces acnegenic, fetotoxic, teratogenic, mutagenic, carcinogenic, and immunogenic effects. In humans, it is known to have an acnegenic effect (chloracne) and suspected of causing soft tissue sarcoma, non-Hodgkin's Lymphoma, Hodgkin's disease, and porphyria cutanea tarda.

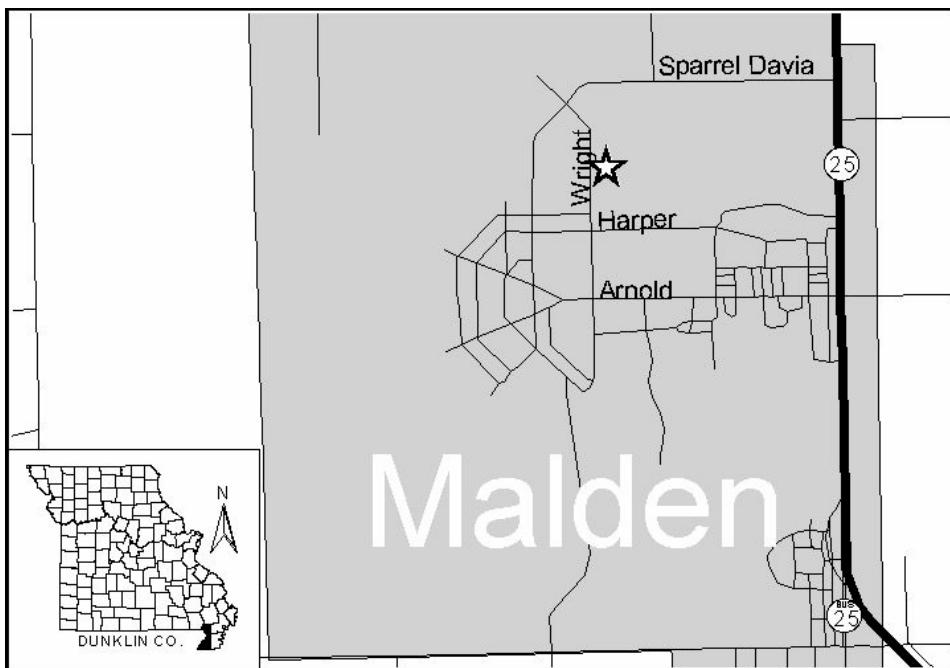
Routes of exposure at this site are dermal contact and ingestion of soil. The city water supply would not be expected to be contaminated since its source is a deep well located 1.5 miles to the west.

The nearest residences are located along High Street, about one-fourth of a mile from the site. Population density surrounding the site is low, and until recently, there was little evidence of human disturbance. This site is located in a city park with unrestricted access. A baseball complex was built very near the area with residual contamination, and nature trails and an archery range were added. No warning signs are visible from the developed portion of the park. Due to these factors and the increased numbers of visitors to the park, the potential for exposure to contaminants exists and is increasing.

Until the site is recharacterized and more complete information is determined about the volume of residual contamination and its proximity to and accessibility by the public, this site still poses a health risk.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Bee Cee Manufacturing



Site Name: Bee Cee Manufacturing

Classification: Class 4

Date of Placement: July 8, 1988

Address: Harper Drive, Malden Industrial Park, Malden, Dunklin County, Missouri, SE 1/4, SE 1/4, Sec. 28, T. 23N, R. 10E, Malden Quadrangle

Present Property Owner: City of Malden

Lead Agency: DNR

Waste Type: Metal plating process wastewater, containing hexavalent chromium

Quantity: Not determined

Site Description:

From 1964 to 1983, Bee Cee Manufacturing Company (Bee Cee) manufactured aluminum storm windows and doors on this 3-acre site in the city of Malden's Industrial Park. As part of its operations, Bee Cee treated aluminum moldings to clean and etch the metal before applying a finish coat of paint. In the manufacturing process, the company dipped

the aluminum frames through a series of large vats that contained chemicals and rinsewater. The contents of these vats were periodically dumped onto the ground surface behind the building, where the untreated wastewater readily percolated into the sandy soil and contaminated the shallow groundwater of the area. The untreated wastewater contained chromium, aluminum, nickel, lead, fluoride and phosphates. The discharge visibly affected an area of ground behind the building about 50 by 100 feet. In 1983, Bee Cee declared bankruptcy. A removal action completed in 1992 removed contaminated soil and other debris at the site. In addition, abandoned buildings located on site were demolished and removed, and the site now has a good vegetative cover.

Environmental Problems and Areas of Concern Related to Site:

The Bee Cee Site is located in a permeable alluvial setting, where rapid movement of contaminants to the shallow groundwater aquifer is very likely. Waste migration in the groundwater is the primary concern for this site, which is listed on the U.S. Environmental Protection Agency's (EPA) National Priorities List.

Remedial Actions at Site:

After going bankrupt, Bee Cee abandoned five vats of aqueous industrial waste at the site. Falcon Door & Window Company, a later occupant of the building, took responsibility for removing the vats. One of the five vats contained liquid hazardous waste. The contents of the other vats were not hazardous. On March 20, 1986, the vat containing the liquid hazardous waste was removed and disposed under full compliance with a Missouri Department of Natural Resources administrative order. The other four vats of non-hazardous material were also disposed properly.

The Remedial Investigation/Feasibility Study for Operable Unit 1 began in November 1991. All soil sampling and limited groundwater sampling has shown excessive chromium contamination. In February 1992, the EPA initiated a study to determine if an early removal action (source soil removal) was feasible. Coordination of efforts between the department and the EPA of data acquisition and remedial methods resulted in the EPA approving an EPA-lead removal action.

The EPA completed the removal action in the fall of 1992. The contaminated soil was removed, along with the abandoned waste remaining in tanks and vats. All abandoned buildings located on site were demolished and properly disposed. Action levels for total chrome, which is 2,000 parts per million (ppm), and hexavalent chromium (180 ppm) were developed between the EPA, the department, the Agency for Toxic Substances and Disease Registry (ATSDR), and the Missouri Department of Health and Senior Services (DHSS). A Further Investigation of Groundwater was completed and submitted in June 1993, indicating a chromium-contaminated plume in excess of the EPA's drinking water standard, the Maximum Contaminant Level. Currently, no threat exists to public drinking water; however, a threat is posed to future use at the site.

A Record of Decision formalizing the remedial measures in the proposed plan, which includes natural attenuation and groundwater monitoring, was signed by the EPA in

September 1997. In March 1999, the EPA approved the Remedial Design (RD) completed by the department. The EPA requested that the site owner, the city of Malden, conduct the remedial work. The city declined, citing a lack of financial means. Therefore, site work will be primarily federally funded, and the state will perform the remedial work.

The Remedial Action (RA) involved the installation of five additional monitoring wells in September 1999. Annual groundwater monitoring of the ten total wells at the site will measure natural attenuation. Groundwater monitoring will ensure that hexavalent chromium at concentrations in excess of the screening level of 18 parts per billion is not migrating off site, and that the chromium contamination is attenuating. The preliminary closeout report prepared by the department was signed on September 10, 1999 by the EPA, and the construction completion is considered attained for this site.

In November 2001, the department conducted sampling of the ten wells for the third year of the 10-year annual monitoring program. The analytical results showed the presence of hexavalent chromium as high as 13 parts per billion (ppb) (down from 34 ppb last year). From past and current sampling, only two wells have detected hexavalent chromium. The remediation goal for hexavalent chromium is 18 ppb. In 2001, only three wells were detected with total chromium above the cleanup level. The remediation goal for total chromium is 100 ppb.

Monitoring will continue for two more years. If hexavalent chromium and total chromium continue to fall below the remediation goal, then monitoring will be discontinued and NPL delisting procedures will be initiated.

General Geologic and Hydrologic Setting:

The Bee Cee Site is on the east edge of the Kennett-Malden Prairie, a low alluvial terrace that parallels Crowley's Ridge. Sand and gravel up to 150 feet thick underlie the site. The highly-permeable alluvium readily absorbs the vast majority of the precipitation

that falls on the site. Surface runoff occurs only during intense rainfall.

Water and other fluids introduced onto the surface would be expected to move rapidly down to the water table, which is estimated to be 8 to 12 feet below the surface. The water table elevation changes seasonally on a regional scale and may be influenced locally by water supply wells and irrigation wells producing from the alluvium. The direction of groundwater movement in the alluvial aquifer is to the east-southeast.

The Wilcox Group, which consists of loosely-consolidated sands and clays, underlies the alluvium. Downward movement of contaminants is retarded by the uppermost clay layer in the Wilcox Group. Sandy intervals of the Wilcox Group may be used as a water supply, but generally are not because the alluvial aquifer is shallower and of comparable quality.

The underlying McNairy aquifer, which is tapped by some of the Malden public supply wells, has a piezometric head above the ground surface; that is, it is artesian. It is highly unlikely that contaminants from the Bee Cee Site would affect this deep aquifer.

Public Drinking Water Advisory:

The city of Malden's main city well (known as Well No. 4) is located about 1,000 feet west-southwest of the site. The proximity of the well poses little concern, because the well draws from the deep aquifer, which should be isolated from contamination due to special geologic and hydrologic conditions shown by the aquifer. The city also has three other wells that draw from the shallow, Quaternary alluvial aquifer. These wells are located 2 to 4 miles south of the site. Due to the susceptible geologic characteristics of this aquifer, these wells pose a potential threat to the public water system of Malden, and to Dunklin Public Water Supply District No. 1, which purchases water from Malden.

Although no contamination was detected in water from the city's wells, timely cleanup of the site and routine groundwater monitoring are necessary to ensure that the wells are not affected in the future.

Health Assessment:

Possible exposure pathways include the ingestion of contaminated groundwater, direct contact with the contaminated soil, and inhalation of dust from the contaminated soil. However, the contact and inhalation routes of exposure are expected to be of minor concern. The ingestion route could be of major concern if the contamination reached the city well; however, this is not expected because the city well pulls its water from the deep aquifer that is isolated from the shallow aquifer by the relatively impermeable Porter Creek clay formation.

The area served by the Malden city water system has only a few isolated shallow wells. An initial analysis of these shallow wells and of the Malden City Well No. 4 showed nickel levels in a few shallow wells that were slightly above the recommended safe lifetime level. Subsequent rounds of testing on these same wells by the Department of Health Senior Services (DHSS) showed nickel levels below the recommended drinking water standard. Nickel was not detected in the most recent round of sampling. Yearly groundwater monitoring by the DHSS will continue.

The following are the major contaminants of concern found at the site: chromium, aluminum, nickel, lead and phosphate. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

Based upon available information, it seems that no exposure is occurring at the present time. Sampling of monitoring wells and private wells in the area should continue to ensure that no one is exposed to unacceptable concentrations of contaminants from the site.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Chevron Chemical Company



Site Name: Chevron Chemical Company

Classification: Class 4

Date of Placement: January 6, 1984

Address: 2497 Adie Road, Maryland Heights, St. Louis County, Missouri, SW 1/4, SE 1/4, Sec. 23, T. 46N, R. 5E, Creve Coeur Quadrangle

Present Property Owner: Chevron Chemical Company

Lead Agency: EPA

Waste Type: Pesticides and arsenic

Quantity: Not determined

Site Description:

The site is a former pesticide and fertilizer formulation plant that operated for over 30 years. Spills and leaks at the plant may have contributed to contamination. The site is located in a light industrial area in the Fee Fee Creek watershed. Fire debris contaminated with pesticides was buried on site in unlined pits in the 1950's. This area is currently

located under buildings and is not accessible. Additionally, up to 4,800 pounds of the fungicide Maneb were buried on site in 1974. A change of use request was approved for use of the facility as warehouse space. Building space was leased to several businesses. These businesses will not impact or influence current site conditions. The entire property is listed on the Registry.

This site is located in a commercial and industrial area, bordering residential areas with 3,000 people in a 0.5 mile radius. It is not publicly traveled or a public use area.

Environmental Problems and Areas of Concern Related to Site:

Pesticides were detected in the soil and shallow groundwater on the plant site. In 1981, the level of groundwater contamination was as high as 2,300 parts per billion (ppb) of 2,4-D. Groundwater contamination was found at the perimeter of the hazardous waste site in the downgradient direction of the groundwater flow. Five private wells were identified as drawing from the aquifer of concern within a 3-mile radius. The primary use of groundwater is to process industrial water.

The nearest down slope surface water is Fee Fee Creek, which is used occasionally for trapping furbearers.

Remedial Actions at Site:

The Chevron Chemical Company submitted soil sampling and groundwater monitoring data to the U.S. Environmental Protection Agency (EPA). The company plans to continue quarterly groundwater monitoring. Field work includes 23 on-site monitoring wells, five off-site monitoring wells, six off-site soil borings at the suspected arsenic spill, a surface geophysical survey, and 56 on-site soil borings. An abandoned sewer system at the facility was pumped of its contents in February 1987. Sampling of the runoff collected in the sewer indicated some pesticide and arsenic contamination. Surface water samples collected in March 1987 did not indicate significant levels of contamination. A sample collected from a seep below Building D indicated low levels of arsenic and pesticide contamination.

A supplemental site investigation was conducted by Chevron in 1989 that included on- and off-site soil sampling. This sampling identified areas of surface soil contamination showing high levels of pesticides and insecticides. Chevron capped and paved the off-site contaminated loading area, and installed an additional off-site deep monitoring well to monitor contaminant migration. Previous remedial actions have included paving and capping contaminated on-site soils to reduce migration of contaminants into groundwater.

During 1995, the EPA and the Missouri Department of Natural Resources concluded that groundwater monitoring would be conducted annually for a period of five years by the Potentially Responsible Party.

In 2001, annual groundwater sampling indicated that natural attenuation was occurring at the site. Because contaminants continue to be present in groundwater, monitoring will continue in order to assess natural attenuation.

General Geologic and Hydrologic Setting:

The site is underlain by 20 to 30 feet of loess, or wind-deposited, clayey silt, over Pennsylvanian shale or residual clay. Below the shale or clay, at a depth of about 30 to 70 feet, there is a limestone unit that is part of the uppermost aquifer at the site.

The confining unit at the base of this aquifer is the Maquoketa Shale at a depth of several hundred feet. Water from deeper horizons of the limestone aquifer may be too saline to be considered potable. The shallow part of the bedrock aquifer probably produces good-quality water; however, yields may be low. Groundwater is not used widely in this area due to the presence of public surface water supplies.

Perched water is present in the loess, but yields are so low that this is not considered an aquifer. The perched groundwater has been affected by contaminants at the site. Due to the presence of low-permeability material beneath the loess, the water within the loess is expected to discharge to the surface or to buried sewer lines downgradient of the site.

Public Drinking Water Advisory:

This area is served by St. Louis County Water Company, which uses the Missouri and Meramec Rivers as sources. Some area residents may have private wells. This site poses no threat to public water supplies.

Health Assessment:

Investigations indicated the presence of soil contamination both on and off site; however, the off-site contamination was found only in the area next to the former arsenic off-loading dock. Since these areas have been capped and paved, potential human exposure is limited. Also, the potential for human contact with the contaminated soil on site is low since the site is fenced, secured and covered with buildings. For these same reasons, the potential for exposure from airborne contaminants and surface water is expected to be low.

The following are the major contaminants of concern found at the site: aldrin, arsenic,

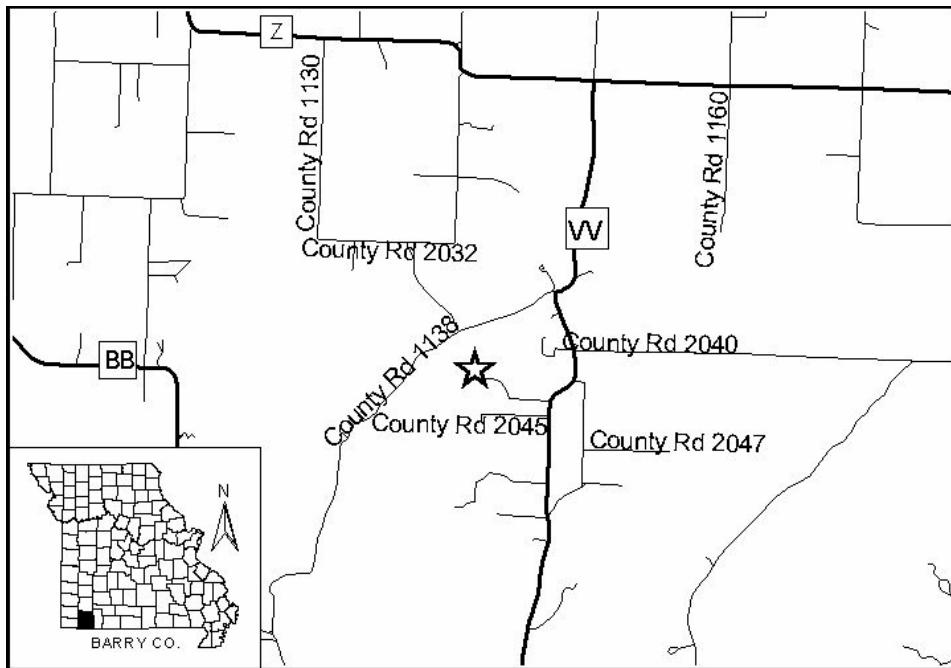
2-4-D, dieldrin, lindane, and total xylenes. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

Exposure to the public from groundwater contamination is not expected because: (1) the only private wells in the area are one-half mile away and upgradient from the site; and (2) downgradient areas are served by public drinking water. A recent site inspection by department personnel revealed that the site has been leased to several companies

whose business practices do not disturb soil or the parking area and entrance driveway. Based on available information, the potential for exposure to the general public and to workers on site is low. If conditions at the site change, and exposure to contaminated soil occurs, adverse health effects could occur

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Denney Farm (Capped Trench)



Site Name: Denney Farm (Capped Trench)

Classification: Class 4

Date of Placement: January 24, 1992

Address: Seven miles south of Verona, Barry County, west of Highway VV, Part of NW 1/4, Sec. 20, T. 25N, R. 26W, McDowell Quadrangle

Present Property Owners: James Denney

Lead Agency: DNR

Waste Type: 2,3,7,8-TCDD (dioxin)

Quantity: Not determined

Site Description:

In 1971, about 90 drums of chemical wastes were buried in a shallow trench at this site. In 1981, the U.S. Environmental Protection Agency excavated and removed the drums and a large quantity of contaminated soil. When excavated, the trench measured roughly 12 by 61 feet and was 5 feet deep. Soil analyses indicated dioxin contamination remained in the trench; however, due to excavation constraints, the decision was

made to cease excavation at that point and cap the trench. The total Registry area, including the capped trench and the uncontaminated buffer, is 1.5 acres. The site is located in a cattle pasture that remains well-vegetated and marked with permanent monuments. The trench is surrounded by an open field and several acres of forest.

Environmental Problems and Areas of Concern Related to Site:

Surface erosion and deterioration of the cap is a long-term concern. However, to date, the cap remains in excellent condition, and is well-vegetated with no signs of erosion.

Remedial Actions at Site:

In June 1981, about 90 drums of dioxin-tainted waste were excavated and removed from the trench. After the drum removal, an estimated additional 140 cubic yards of soil was removed from the trench. Both the soil and drummed waste were later destroyed on site via thermal treatment. The trench was then backfilled and capped, with some dioxin contamination remaining. An estimated 112 cubic yards of soil averaging 10 parts per billion (ppb) dioxin remains in the trench, with a maximum level of 530 ppb remaining. The

decision to backfill the trench was based on the following information from geologic and waste isolation professionals: the sides and bottom of the trench were composed of soil that was very dense and impermeable, which was substantiated by a permeability test performed by the Missouri Department of Natural Resources; no joints or openings capable of transmitting water from the surface to underlying bedrock were noted; and the remaining dioxin was considered immobile and would not migrate unless transported by water percolating through the trench.

Monitoring well analyses indicated no significant pollutant loss occurred from the trench. To prevent water percolation, an impermeable cap was installed. Cap construction consisted of sloping the trench sides to allow a better seal between the natural soil and backfill material. The trench was then backfilled with low permeability clay and compacted in 6-inch lifts. An over-encompassing, impermeable plastic cap was placed over the backfilled trench. This cap was constructed in four layers: a 3-inch sand cushion, the plastic liner, a second 3-inch sand cushion, and 6 inches of topsoil. Sod was then placed over the topsoil to prevent erosion of the impermeable cap. Monuments at the corners of the trench permanently mark the area.

General Geologic and Hydrologic Settings:

The topography around the site is characterized by valleys and ridges. The major streams have broad, flat, deeply-incised valleys, and smaller tributaries dissect the plateau surface, resulting in rugged terrain. The site sits atop a northwest-trending ridge that is truncated by the valley of Calton Creek. The site itself is nearly flat. Surface runoff drains to the northeast or southwest to small tributaries of Calton Creek. Although the section of Calton Creek nearest the site is gaining, upstream and downstream reaches and most of the Calton Creek tributaries lose significant portions of their flow to the subsurface. Due to the highly permeable nature of the surface materials and bedrock, surface runoff around the site rarely occurs.

Site soils are composed of a 3-foot thick layer of loamy silt, overlying 10 to 40 feet of very

cherty, red, clay residuum, derived from the weathering of the bedrock. Across portions of the site, a fragipan (densely packed layer of chert fragments and clay) may exist at a depth of about 3 feet. This fragipan typically acts as a barrier to downward migration of water, causing seasonal or temporary perched water conditions. The underlying residuum is typically highly permeable.

Bedrock beneath the site is the Reeds Spring Formation, a very cherty limestone, which, along with the underlying Pierson Formation, represents the shallow aquifer in this area. Permeability is generally high, due to weathering and solution activity along fractures and bedding planes. Solution weathering typically produces a pinnacled bedrock surface, accounting for a wide range in the thickness of surficial materials. Solution weathering also produces karst features, such as caves, sinkholes and springs. Remnants of a Pennsylvanian-age sandstone layer are also present near the site.

Due to limited yields, the shallow aquifer primarily serves individual households. Wells requiring high yields, such as community wells, must tap the deep aquifer, which is composed of Cambrian- and Ordovician-age carbonates and sandstones. The deeper aquifer is separated effectively from the shallow aquifer by a confining unit at a depth of about 300 feet.

Public Drinking Water Advisory:

No public water systems are close to the site. Most nearby residences are served by private wells, which may be at risk due to the karst topography and permeable soil in the area. That risk should be minimal as long as the site is maintained properly to prevent migration of contaminants.

Health Assessment:

Exposure routes to the dioxin at this site include any or all of the following: ingestion of the contaminated soil, inhalation of contaminated dust particles, and dermal contact with the contaminated soil or dust. Surface and groundwater contamination is unlikely because of the impermeable cap. Dioxin is one of the most toxic substances

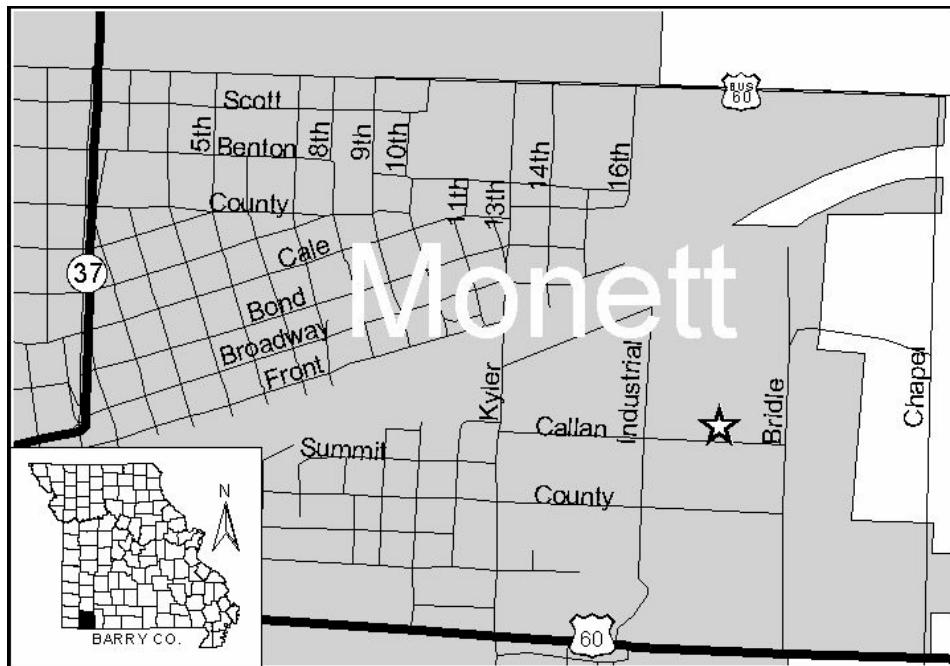
known; however, its toxicity varies greatly between species. Animal studies have shown that dioxin produces acnegenic, fetotoxic, teratogenic, mutagenic, carcinogenic, and immunogenic effects. In humans, it is known to have an acnegenic effect (chloracne). It is also suspected to cause soft tissue sarcoma, non-Hodgkin's lymphoma, Hodgkin's disease, and porphyria cutanea tarda.

Based on the available information, this site does not appear to present a significant health risk to the public at this time. The site has an

adequate cap and is in a remote area. However, if the use of this site were to change, or excavation or surface grading were to occur and expose contaminated soil, exposure to dioxin-contaminated soil could occur.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

G & R Metals



Site Name: G & R Metals

Classification: Class 4

Date of Placement: August 17, 1989

Address: Monett Industrial Park, one-half block east of the intersection of Callan and Industrial Streets on the north side of Callan Road. Portions of the NW 1/4, SE 1/4, Sec. 32, T. 26N, R. 27W, Barry County, Missouri, Monett Quadrangle

Present Property Owner: Wintech Real Estate, LC

Lead Agency: DNR

Waste Type: Cadmium, chromium and cyanide

Quantity: Not determined

Site Description:

From 1969 to 1976, the G & R Metals Company operated a metal finishing and plating business on this site. G & R used a 6-to 8-acre lagoon on the property as an impoundment for cyanide- and cadmium-contaminated waste waters discharged from

its production processes. The lagoon was constructed without a permit or geologic evaluation and reportedly had a leakage problem. G & R ceased doing business in the fall of 1976. The sides of the lagoon were subsequently pushed in and the area leveled.

The land surrounding this site is primarily an industrial park. Many small industries, primarily light manufacturing, exist in the area.

Environmental Problems and Areas of Concern Related to Site:

The most significant environmental problems are the potential off-site transport of contaminated soil by surface erosion and potential leaching of contaminants into the local shallow groundwater supply.

Remedial Actions at Site:

The contaminated sludge lagoon was closed and backfilled in 1976. Monett Industrial Development Corporation (MIDC) applied to the Missouri Department of Natural Resources' Voluntary Cleanup Program (VCP) and was accepted in January 1997. A monitoring well was drilled to sample the uppermost aquifer below the site for metals contamination prior to approval of a proposed

cap over the site. In 1997, no contaminants were detected above drinking water standards; however, cyanide was detected above background levels at a depth of 40 feet. In February 2000, sampling of the monitoring well indicated a dissolved lead concentration in the groundwater above drinking water standards. The department requested further sampling to investigate lead levels in the groundwater. Additional groundwater samples have had no further contamination detected above standards.

The remedial action plan, prepared by MIDC and approved in 1999, proposed the installation of a cap with an impermeable clay liner. Surface sampling was done to determine the required area of coverage of the cap.

Contaminated soils were scraped off a large area of the site and consolidated in a smaller area. Verification sampling has shown that the scraped areas are below VCP commercial and industrial levels for chromium, cyanide and cadmium. After surveying the consolidation area, an engineered cap made of compacted clay was placed over the contaminated soil. The cap will prevent direct exposure to humans and the environment and will prevent infiltration of rainwater so that groundwater will not be affected by the contamination.

Closure of the site was completed under the VCP in 2001. The cap was covered with a compacted gravel driving surface. A change of use request to use the capped area for an industrial parking lot and storage area was approved in 2002. A survey delineated the capped area and installed barriers. A restrictive covenant was filed in the property chain of title to prevent disturbance of the cap. The Registry area was reduced to the portion of the site where the capped waste is located with permanent markers.

General Geologic and Hydrologic Setting:

The land surface at the site gently slopes to the north-northwest toward Kelly Creek, which is about 200 feet from the site and 35 to 40 feet lower in elevation. Kelly Creek carries water only after heavy rains, generally losing all of its flow to the subsurface.

Bedrock is composed of highly-weathered, cherty limestone. The overlying residuum formed from this weathering is a very cherty, red clay that has a moderate to high permeability. The residuum is 50 to 70 feet thick. Solution-enlarged fractures and bedding planes within the bedrock allow for rapid recharge of the shallow aquifer.

The shallow aquifer is made up of cherty limestone, which provides a source of water for domestic wells in the area. It is susceptible to contamination from the site. The shallow aquifer is separated from the deeper aquifer by a confining layer, which is present at a depth of greater than 300 feet. The city of Monett draws its water supply from the deeper aquifer. Groundwater flow in both aquifers is expected to be toward the west.

Public Drinking Water Advisory:

The 11 wells for the city of Monett are located within 2 miles of the site.

The nearest city well (No. 14), 0.25 miles southwest of the site, is 1,600 feet deep with 555 feet of casing. Well No. 13, 0.5 miles away, is 1,420 feet deep and has 500 feet of casing. Both are constructed into the Potosi Formation.

Since the area is highly permeable and karst, shallow groundwater is susceptible to contamination from the surface. The deeper aquifer, from which the city draws water, is less susceptible due to the confining bed that separates the two aquifers. Downward migration of contaminants from the site could potentially affect nearby drinking water wells.

Health Assessment:

Long-term low-level exposure to cadmium may cause kidney damage, kidney stones, skeletal effects, and possibly high blood pressure. The liver, testis, immune system, nervous system and blood may also be affected. High amounts of cadmium may cause stomach irritation leading to nausea, vomiting and diarrhea. Exposure to excessive amounts of cyanide may cause weakness, headache, confusion, nausea and vomiting. Large doses of cyanide may cause loss of

consciousness, cessation of respiration and death.

The highly permeable soils and karst topography of this area make the leaching of chemicals from this site into the shallow aquifer a possibility. Leaching of chemicals off site is a health concern due to the possible contamination of area groundwater. However, a door-to-door survey failed to locate any private water wells around the site. A monitoring well placed downgradient of the lagoon showed a lead level of 31 parts per billion (ppb), twice the EPA's drinking water standard, the Maximum Contaminant Level. However, subsequent sampling found no further contamination above health standards. Quarterly monitoring was discontinued.

Based on available information, the site appears to present little health risk in its current condition. Soils containing high levels of metals were consolidated and placed under a clay cap. Soils remaining in other areas of the site are below occupational levels of concern. As long as the site is not developed residentially and the cap is properly maintained, the site should not present a health risk.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.



Site Name: International Paper

Classification: Class 4

Date of Placement: June 14, 1984

Address: 2609 S. Rangeline, Joplin, Jasper County, Missouri, Portions of Sec. 18, T. 27N, R. 32W, Joplin East Quadrangle

Present Property Owner: International Paper, Inc.

Lead Agency: DNR

Waste Type: Creosote, arsenic, barium, cadmium, lead, and polycyclic aromatic hydrocarbons including pentachlorophenol

Quantity: Approximately 12,000 tons of contaminated soil.

Site Description:

International Paper is an active wood treating facility, 110 acres in total size, located in a moderately industrialized area in the eastern portion of Joplin, Missouri. About 500 people and 40 buildings are located in the area.

The facility contained nine surface impoundments covering 11 acres which have been closed under Resource Conservation and Recovery Act (RCRA) closure requirements and guidance. Prior to 1980, two of the impoundments containing hazardous waste were filled, with the waste left in place. In 1986, hazardous sludges were removed from all of the site impoundments. The remaining contaminated soils are being treated.

The two inactive impoundments (portions of numbers five and six) are the areas included on the Registry. The soils remaining in both of the inactive impoundments have been found to be contaminated with several wood treatment chemicals, which require treatment under the RCRA closure plan. A survey sealed by a registered land surveyor depicting the legal description of the contaminated area and a 100-foot buffer zone was submitted to the Missouri Department of Natural Resources. The area included on the Registry encompasses 4.5 acres.

Environmental Problems and Areas of Concern Related to Site:

Hazardous constituents, derived from the wood treating process and listed as a

hazardous waste, were detected in both groundwater and surface water samples. Previous mining activities beneath adjoining properties contribute to the complexity of the geology in the area. Potential off-site surface water and groundwater contamination is a concern which is being addressed by ongoing remediation activities.

Remedial Actions at Site:

The International Paper Company is continuing to move forward with the cleanup and closure of the former impoundments. All surface impoundments have been closed and the lightly- to moderately- contaminated soils are being bioremediated under RCRA requirements. International Paper has remediated approximately 19,000 cubic yards of contaminated soil. This is 24.5 percent of the total volume to be treated, exceeding the 20 percent that was required to be treated in the first treatment cycle.

Four large roof structures, totaling ten acres, were built over the former impoundments to control runoff and to enhance bioremediation activity. The construction of the roof structures was completed in 1994, and pilot scale operations began soon after. They have been engineered to be protective of human health and the environment. Treated soil is being stored in the four bioremediation beds. Approval has been given to the facility to remove and clean any rocks bigger than 60 millimeters from the treatment cells. They have added splash and wind guards on all decontamination pads to prevent the loss of overspray in the decontamination of equipment.

Impervious liners, along with a leachate collection system, are being used during bioremediation to minimize the potential for further migration of contaminants into the groundwater. The project is being managed as a long-term cleanup and is scheduled for completion around the year 2005. Bioremediation units No. 1, 4 and 5 have the first 30 inches of soil bioremediated. Bioremediation unit No. 7 has the first 27 inches bioremediated. To date, the first 1 foot of soil in Bioremediation Unit No. 1 has been remediated and will be stored in a designated storage area in that unit. Once the

contaminated soils have been treated or sent off site for proper disposal, the bioremediation areas will be capped with impervious materials to prevent long-term migration of precipitation through the remediated materials and into the groundwater.

In addition to the ongoing remediation project, International Paper has constructed concrete floors, retaining walls and ground storage tanks to prevent pollution from current operations or spills. International Paper has previously constructed a concrete drip track and roof structure outside the pressure retorts area for catching the "kickback" of preservatives from treated poles.

International Paper has completed and is operating a groundwater remediation system. The site contains a total of 68 monitoring wells. Wood-treating constituents have been detected in the groundwater. This groundwater remediation system has been in place since 1994, and evidence has shown that International Paper is maintaining hydraulic control of the groundwater plume. The system includes wells placed in mine cavities and other formations to collect the contaminated groundwater and an on-site pretreatment waste water system. International Paper has, for the most part, defined the rate and extent of contamination, given the complex geology associated with the site, but might be required to further define specific areas of concern. The groundwater treatment system is scheduled to operate for a period of 30 years.

International Paper was approved to modify operation of the bioremediation beds. All of the soil was consolidated in two of the original four beds. The remaining two beds were closed and encapsulated, allowing reuse of the overlying areas. The preferred reuse will be treated telephone pole storage to minimize runoff of treatment materials.

General Geologic and Hydrologic Setting:

Across the eastern and southern upland portions of the site, gravelly, red clay residuum has developed from the underlying bedrock composed of the Mississippian-age Warsaw Formation. Mining has occurred in the limestone of the Warsaw Formation,

resulting in surface depressions and water-filled mine openings. The older Mississippian-age Burlington Limestone is present along the hill slopes. Groundwater occurs at depths of 5 to 15 feet below grade and exhibits significant elevation fluctuations, depending upon precipitation conditions. Some abandoned borings related to mining exhibit artesian flow during portions of the year.

The geology changes significantly in the north and northwest portion of the site, where a brownish, silty clay residuum has developed from underlying shales of Pennsylvanian age. Mining has not occurred in areas underlain by the shale. Groundwater is deeper in these areas, but can be accessed by boring through the shale.

A shallow groundwater divide is present near the center of the site. Groundwater flow to the north discharges at Turkey Creek, and flow to the south discharges at Silver Creek.

A deep aquifer extends from 300 to 1,800 feet below grade and consists of Ordovician-age and Cambrian-age cherty dolomites and sandstones. The deep aquifer is separated from the shallow aquifer by relatively impermeable Mississippian-age shale and shaly limestones ranging up to 40 feet in thickness.

Public Drinking Water Advisory:

A portion of the site is located in the drainage area of Silver Creek, a tributary to Shoal Creek and the source of drinking water for the city of Joplin. Remedial actions to control and treat contaminated surface water from the site ensure that contaminants do not endanger the city's water system.

Wells that provide water to three mobile home parks are located 1.5 to 3 miles from the site.

The Missouri American Water Company, the water supplier for the city of Joplin, recently has drilled a new well about one mile north of the site. This well is cased to 500 feet and is not expected to be affected by the site. This provides evidence that new water sources continue to be developed from the deep aquifer. Shallow, on-site groundwater has been contaminated. Therefore, continued groundwater monitoring is imperative to ensure that contamination does not reach the deeper aquifers from which the public water supply wells draw.

Health Assessment:

Seven private wells in the Silver Creek and Duquesne area were sampled in April 1991. These were the closest private wells to the site. Trichloroethylene was detected in two wells; however, this contamination does not appear to be related to the International Paper Site. A different industrial operation in the vicinity has been implicated in what has become a widespread release involving nearly one hundred private wells.

Due to the toxicity of the hazardous chemicals and groundwater contamination, a health risk exists at this site. Groundwater monitoring to detect any remaining contamination, as well as possible off-site movement, will enable health officials to assess potential human exposure. Ironically, there is less potential for exposure from this site because the groundwater contamination from the other facility has resulted in the extension of public water lines.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Jones Truck Lines



Site Name: Jones Truck Lines

Classification: Class 4

Date of Placement: January 1, 1984

Address: 5601 Hall Street, St. Louis, Missouri, T. 46N, R. 7E, Granite City Quadrangle

Present Property Owner: Midwest Systems, Inc., St. Louis, MO

Lead Agency: EPA

Waste Type: 2,3,7,8-TCDD (dioxin)

Quantity: Not determined

Site Description:

Following its use as a municipal waste landfill from 1953 to 1965, Jones Truck Lines operated a truck terminal on site. The site was sprayed with dioxin-contaminated oil as a dust suppression measure in the early 1970's. Jones Truck Lines has moved to a new location, and the site is currently leased by Franklin College Truck Driving School. The contaminated areas are capped with asphalt. The entire site is fenced, except for a small

area found not to be contaminated. The site is gated and a "no trespassing" sign posted.

Environmental Problems and Areas of Concern Related to Site:

The site is surrounded by other truck terminals and bordered on the rear by a railroad yard, where most of the surface runoff goes.

Remedial Actions at Site:

In 1974, the front half of the lot was paved. In 1978, the remainder of the lot was paved except for about two percent of the total area. In 1994, the U.S. Environmental Protection Agency (EPA) characterized the site to determine the full extent of dioxin contamination.

This site is one of 27 eastern Missouri dioxin sites subject to a Consent Decree entered in Federal District Court on December 31, 1990. The on-site buildings were decontaminated. In accordance with the Consent Decree, a thermal treatment unit was constructed at Times Beach and used to treat dioxin-contaminated soils from this site.

From October 16, 1995, to November 28, 1995, the EPA performed an excavation of all dioxin greater than 20 parts per billion (ppb)

and transported the materials to Times Beach to be incinerated. A total of 3,635 tons of soil was excavated from the site. Soil is contaminated with dioxin at concentrations up to 20 ppb. The site was capped and the property owner will be required to maintain the cap in perpetuity. During 1999, the property owner hired a contractor to perform Underground Storage Tank (UST) closures for two USTs that were closed in place due to the presence of dioxin directly over the former USTs. The asphalt cap over the majority of the site is in good condition. The area over the USTs was not capped adequately; therefore, the Office of the Attorney General contacted the company in July 1999 to urge the completion of the cap in this area. The cap is now complete.

In September 1999, ownership of the site changed to Midwest Systems Inc. of St. Louis, Missouri.

General Geologic and Hydrologic Setting:

The site is located on the western edge of the Mississippi River flood plain. Much development has occurred in this area, with many alterations of the natural setting. The thickness of the fill material is unknown; however, due to the age of the site, the majority of ground surface settling has probably already occurred. The asphalt cover restricts surface water infiltration.

The alluvial material beneath the site is composed of clay- to sand-sized particles. The alluvium is expected to be less than 45 feet thick. The direction of groundwater movement is toward the river, where it is eventually discharged. Due to the industrialized nature of the area, some contamination of the alluvial waters is probable, but identification of a specific source would be very difficult. It may take several years for any contaminants present in the

shallow groundwater system to discharge to the river.

Bedrock under the site is Mississippian-age limestone. At this location, the Mississippian limestones are not favorable for the development of drinking water wells, since high total dissolved solids render the water unusable for most purposes.

Public Drinking Water Advisory:

This area is served by St. Louis City Water Department, which uses the Missouri River and the Mississippi River as sources. The site poses no threat to the public water supply.

Health Assessment:

Dioxin is one of the most toxic substances known; however, its toxicity varies greatly between species. Animal studies have shown that dioxin produces acnegenic, fetotoxic, teratogenic, mutagenic, carcinogenic, and immunogenic effects. In humans, it is known to have an acnegenic effect (chloracne). It also is suspected to cause soft tissue sarcoma, non-Hodgkin's lymphoma, Hodgkin's disease, and porphyria cutanea tarda.

As long as the dioxin on site remains capped, there are no complete exposure pathways. Potential exposure routes to dioxin at this site include ingestion of contaminated soil, inhalation of contaminated dust particles, or dermal contact with contaminated soils, dust or surface water. If excavation were to occur and contaminated soil became exposed, this could pose a health threat.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Lebanon Phosphorus Spill



Site Name: Lebanon Phosphorus Spill

Classification: Class 4

Date of Placement: July 1, 1985

Address: Two miles northeast of I-44 and W Highway, east on gravel road alongside tracks for 200 feet past Huben railroad marker, Laclede County, SE 1/4, SW 1/4, SW 1/4, Sec. 12, T. 33N, R. 17W, Phillipsburg Quadrangle

Present Property Owner: Burlington Northern Railroad / San Francisco Railway Company

Lead Agency: DNR

Waste Type: Red and yellow phosphorus

Quantity: 5,000 gallons

Site Description:

The Lebanon Phosphorus Spill Site resulted from the August 13, 1972, derailment of a Frisco freight train (now Burlington Northern) about 2 miles northeast of the town of Phillipsburg. The wreck caused spillage of

portions of two tank cars of "red and yellow" phosphorus, another car described variously as soda ash or 12-12-12 fertilizer, one car of "mineral wool" and one car of wooden ties. The wreck resulted in a fire, fueled by the phosphorus that ignites on contact with air. One of the 10,000-gallon phosphorus cars was completely burned, while the other car was only half burned, leaving about 5,000 gallons of liquid; the percentage of phosphorus unknown.

Both of the tank cars were buried on site. The site is located in an upland setting just north of the railroad tracks and east of the county road. No residences are in the immediate vicinity, and land use is agricultural.

Environmental Problems and Areas of Concern Related to Site:

Fish kills occurred at two lakes downstream from the spill site in late November 1972. At the time of the spill, a path of dead vegetation was noted from the burial site to the nearest water course. Areas of stressed vegetation are expanding on the east and west sides of the cap. The cap remains in fairly good condition. Local shallow groundwater near the site is potentially contaminated.

Remedial Actions at Site:

In August 1972, the two tank cars were buried on the property adjoining the railroad property in order to extinguish the phosphorus fire, which combusts on contact with air. The burial site was capped with an asphalt pad. A stone marker, warning not to drill or dig, was placed on top of the pad. Over the years, the asphalt cap began to deteriorate and crumble. In early 1988, the owners installed a new cover at the site. The cover consists of a sand layer covered by 5-ounce polypropylene, then covered by an 18-mil mirafi-coated fabric. Later in the year, the fabric cover was damaged and cut open as a result of someone driving on it.

During October 1988, Burlington Northern constructed a 4-inch thick concrete pad over the site. The concrete pad measures about 60 by 90 feet and is graded slightly to prevent ponding of water. Sections of steel pipe were placed around the perimeter of the pad to prevent vehicles from driving on it.

A 1998 Missouri Department of Natural Resources' inspection of the concrete cap indicated the cap was in good condition, but some minor cracks with grass growing in them were noted. Also, several steel posts had been bent by vandals on the south side of the cap, but access to the cap still appears to be restricted. The concrete monument indicating not to dig in the area remained in place and in good condition. The 2001 inspection indicated that the cracks in the cap had been sealed.

Sampling conducted in 1994, 1996 and 1999, by the department and the Missouri Department of Health and Senior Services, revealed no evidence of contamination above the drinking water standards in any of the tested wells.

Burlington Northern Railway conducted subsurface sampling at the site on June 6, 2000, to determine if contaminant migration has occurred. Sample results indicated that most of the phosphorus levels in the soils near the pad were within normal levels for agricultural soils in Missouri. Three soil samples contained higher concentrations of phosphorus, which Burlington Northern

believes may represent isolated remnants of the original release. The concrete cap was repaired and resealed as a preventative measure to ensure its continued effectiveness.

General Geologic and Hydrologic Setting:

The site is located in an upland setting. On-site soils are composed of stony and sandy clay residuum. Bedrock is composed of sandstone, chert and dolomite of the Roubidoux Formation. The downstream area is characterized by numerous karst features, such as sinkholes and losing stream segments.

The residual soils in which the tank cars are buried are expected to be highly permeable at depth. Leakage from the tank cars could flow through the gravel and enter surface water at Jacob's Lake downgradient of the site. The potential also exists for downward vertical migration of contaminants directly into groundwater supplies. Any surface discharges ultimately enter groundwater supplies through the losing drainage downstream of Jacob's Lake. Regional groundwater supplies could be affected if substantial wastes were to be released in a single event. However, it is entirely possible that the majority of wastes have already been flushed out of the tank cars and into the environment.

Public Drinking Water Advisory:

Laclede Co. PWS #1 drilled a well in 1998 less than a half mile south of the spill site. The well is cased to a depth of 600 feet. Four other public wells are located within 1 to 3 miles of the spill site. All of these wells are deep and adequately constructed to minimize the possibility of contamination.

Health Assessment:

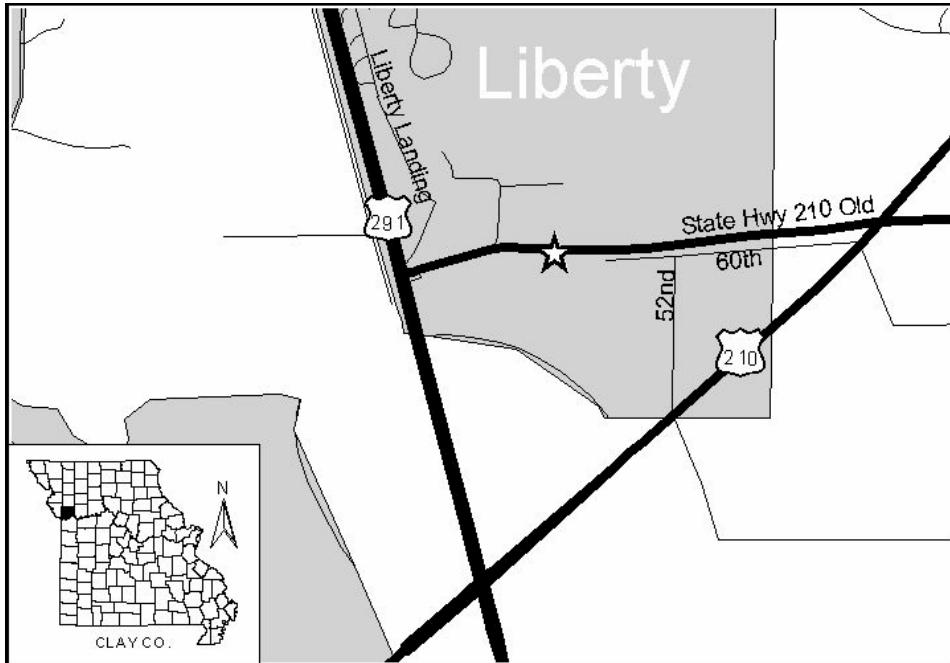
Because the phosphorus disposed at this site is buried, capped and marked, the only possible route of exposure would be through contaminated groundwater supplies. However, if this site were altered, direct contact or inhalation of vapors from the oxidation of the phosphorus could occur.

Phosphorus is dangerously reactive in air. Phosphorus oxidation produces vapors which are irritating to the nose, throat and lungs, as well as the skin, eyes and mucous membranes. Continuous absorption of small amounts of phosphorus can result in necrosis of the mandible or jawbone, the most common symptom. Also, continuous absorption through the lungs and gastrointestinal tract can cause chronic anemia, loss of appetite, gastrointestinal weakness and pallor. Adverse effects on teeth and changes in long bones, causing them to become brittle, can also occur. Phosphorus is not known to be carcinogenic to either humans or other animals. No studies were found to document the possible teratogenic effects of phosphorus, but since it affects bones and teeth during exposure, it may affect the development of these tissues in fetuses and in small children.

Based on available information, no current health threat exists from this site. Because of the highly explosive nature of phosphorus when it comes in contact with air, the hazards associated with removal outweigh the possible health effects of allowing the material to remain buried. The most recent sampling (April 2001) did not identify any contaminated wells. Even though phosphorus has a low solubility in water (3 parts per million), continued monitoring of groundwater and surface water should continue to ensure that water is not contaminated by off-site movement of material.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Lee Chemical



Site Name: Lee Chemical

Classification: Class 4

Date of Placement: January 1, 1984

Address: South of old Highway 210 and north of the railroad tracks, about 0.7 miles east of Highway 291 in Clay County, Missouri, NE 1/4, SW 1/4, Sec. 28, T. 51N, R. 31W, Liberty Quadrangle

Present Property Owner: City of Liberty

Lead Agency: DNR

Waste Type: Trichloroethylene (TCE)

Quantity: Not determined

Site Description:

This site is an abandoned chemical repackaging plant, located in a building that was formerly a water treatment plant. Halogenated hydrocarbons once stored at the site were discovered in a city well. The site is about 2.5 acres in size.

The site is located in a rural area of Clay County. About six business locations are

west of the site. The building that existed on the actual site was removed, and only the foundation remains.

Environmental Problems and Areas of Concern Related to Site:

The TCE and other hydrocarbons at the site have migrated into the groundwater. Groundwater in the area is used for drinking water by the residents of the city of Liberty. However, interim response actions and remedial actions carried out by the city have reduced TCE levels in the groundwater. No wells currently supplying city drinking water have detectable levels of TCE.

Remedial Actions at Site:

Since July 1984, Liberty has been pumping Existing Well No. 3 (EW-3), located on the Lee Chemical Site, and Production Well No. 2 (the most contaminated production well) to Town Branch. The discharge is permitted under the National Pollutant Discharge Elimination System. This pumping has prevented TCE from entering the drinking water system. A steady reduction in contaminant levels was observed over time. TCE levels in the two most contaminated wells, EW-3 and Well No. 2, once as high as

440 parts per billion (ppb), are now 100 ppb or less (combined), based on monitoring in 1990, 1991, 1994, 1995, 1996 and 1997. Today, none of the wells supplying drinking water to Liberty have detectable levels of TCE.

In 1986, the flow from Well No. 2 was increased from 200 to 400 gallons per minute (gpm), to about 1,000 gpm, which further decreased TCE levels in the other production wells. During 1987, Well Nos. 1, 4, 5 and 6 showed non-detectable levels of TCE, and Well No. 3 showed levels less than 10 ppb. In 1988 a new well, No. 7, was added to the supply system, and, in 1991, an eighth well was put into production. Neither show detectable levels of TCE.

In late 1986, the city used a contractor to perform a geophysical study of the subsurface area in the vicinity of the Lee Chemical Site and the well field. This study indicated that the subsurface was more complex than originally thought, and that additional site characterization work was needed to better define the hydrogeologic setting. The study concluded that the TCE contamination was manageable, and that expansion of the current well field to meet future demand was feasible.

The site was fenced in 1987. In 1988, a revised interim Expedited Response Action (ERA) was agreed to by the city of Liberty and the EPA, with concurrence by the Missouri Department of Natural Resources. The ERA guided response actions prior to the initiation of the Remedial Investigation/Feasibility Study (RI/FS). The city has continued the remedial pumping and well field management plan to mitigate any threat to public health by assuring a suitable source of potable water in sufficient quantities.

In August 1988, the city and the department entered into a Consent Agreement, which provided for the city to conduct a RI/FS. The RI field work, conducted by the city under department oversight from early 1989 to mid-1990, included activities to define migration pathways and the extent of soil and groundwater contamination. The RI identified the following: (1) TCE contamination is present in the soil at depths ranging from 1 to 20 feet below ground level, with the highest

concentration, 11,000 ppb, at a depth of 20 feet, east of the old water plant building foundation; (2) a plume of TCE contamination is suspended in and moving with groundwater in the aquifer underlying the site; (3) TCE contamination is present in the out-of-production municipal supply well (WSW2) and abandoned on-site well (EW-3); and (4) no present contamination is in municipal supply wells WSW1, WSW3, WSW4, WSW5, WSW6, and WSW7. The city completed the RI/FS in August 1990.

An Administrative Record was developed under an EPA contract. The RI/FS and Proposed Plan for the site were released to the public for review and comment on December 24, 1990. In addition, a public hearing was held on January 9, 1991, where department and EPA officials answered questions about problems at the site and the remedial alternatives under consideration. A response to comments received during the 30-day comment period was prepared in a Responsiveness Summary, which is part of the Record of Decision (ROD). The ROD was signed by the EPA Region VII Administrator on March 21, 1991.

The major components of the final selected remedy include: (1) extraction of contaminated groundwater to remove contaminants from the aquifer of concern and to control groundwater movement away from the site; (2) installation of an in situ aqueous soil washing system consisting of infiltration trenches to enhance the flushing of contaminants from the site; (3) discharge of the extracted groundwater to Town Branch Creek under the terms of a state operating permit; and (4) implementation of a contingency phase project, consisting of air stripping or other treatment methods, in the event that additional treatment of the discharge water becomes necessary to meet either health based risk levels, existing state operating permit limits, or other appropriate requirements.

In March 1992, the department and the city entered an Administrative Order on Consent for the Remedial Design/Remedial Action (RD/RA). Plans and specifications for implementing the RD/RA were approved in December 1992. A construction contract was

awarded, and startup and operation of a soil flushing system began on January 3, 1994. A prefinal inspection was held on December 29, 1993. On April 26, 1994, the final inspection found all punch list items noted during the previous site visits and prefinal inspection were resolved, and the system was operating and fully functional.

The remedial action system, comprised of in situ soil washing and groundwater extraction and discharge, continues to operate as it has in past years. Aside from periodic repair and maintenance, the remedial action continues to operate as designed, and remains protective of human health and the environment. The department conducted a site visit and sampling in August 2000 to evaluate the remedial action system and generate analytical data regarding performance of the system. The city continues to conduct monthly and quarterly monitoring of the remedial action system, and submits quarterly reports to the department and the EPA.

General Geologic and Hydrologic Setting:

The site is located on the alluvial plain of the Missouri River near the northern valley wall. The present course of the river is nearer the south valley wall about 2 miles south of the site. An abandoned meander loop is present within 0.25 miles south of the Lee Chemical Site.

The site is underlain by about 60 to 90 feet of alluvium. In general, the upper 15 to 35 feet of alluvium is predominately fine-grained material, such as clay and silt. The deeper alluvium is made up mostly of coarse-grained sands and gravels.

Under normal conditions, the water table is generally within 10 to 20 feet of the surface, and the flow direction is to the east-southeast. The city of Liberty well field creates artificially low water levels in the local area, modifying the natural groundwater flow conditions. All of the city's production wells are hydraulically downgradient of the Lee Chemical site. The flow velocity downgradient of the site is, therefore, increased by the influence of the production wells.

Bedrock structure, type and erosional configuration may influence the transportation of contaminants that have migrated downward to the base of the alluvium. Geophysical and borehole data indicate that the bedrock surface, while quite uneven, slopes generally to the south and east. The uppermost bedrock unit below the site is predominantly shale, but may also include thin sandstones or limestones. The migration of dense, non-aqueous phase chemicals that may accumulate at the alluvium/bedrock interface can be difficult to predict in this setting.

Public Drinking Water Advisory:

The eight water supply wells for the city of Liberty are located about 2,000 feet east of the site. The wells are 89 to 102 feet in depth, and are situated in an unconsolidated, alluvial formation. The water system serves more than 20,000 people.

Levels of TCE have dropped significantly from the concentrations recorded in 1982 to 1983. This is probably due to the effect of the city's interim response and remedial actions to date, which include pumping two wells in the alluvial aquifer to a stream in order to contain the contaminated plume and to purge the TCE from the aquifer. Further well field management techniques and treatment modifications by the city have reduced TCE levels in the drinking water to below detection limits.

Health Assessment:

Ingestion of contaminated groundwater from the municipal well field was the main route of exposure. The following are the major contaminants of concern found at the site: carbon tetrachloride, 1,1-dichloroethane, methylene chloride, 1,1,1-trichloroethane, trichloroethylene (TCE). Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

The study population for this site is the residents within the city limits of Liberty. Cancer deaths for the years 1983 to 1993 for the study population were compared to statewide cancer deaths. Based upon the

age-specific cancer death rates, expected cancer deaths were calculated for the site. The observed number of deaths for total cancer was not significantly different from expected. In the 15 to 44 age group, total female breast, leukemia, and lung cancers were significantly higher than expected. In the 65+ age group, total cancer was significantly lower than expected, as was "other cancer." Cervical cancer for this age group was significantly higher than expected.

Nativity data studied were low birth weight births (less than 2500 grams), gestational age less than 37 weeks, and fetal deaths for years 1990 to 1994. The observed low birth weight rate for the hazardous waste site was significantly lower than expected. The observed number of births with a gestational age under 37 weeks was also significantly lower than expected. Using the state rate to calculate the expected number of occurrences, the observed number of fetal deaths was significantly low. A second study of 1980 to 1989 births revealed an observed number of births with anomalies that was significantly lower than the state rate. This study was based upon aggregated birth and

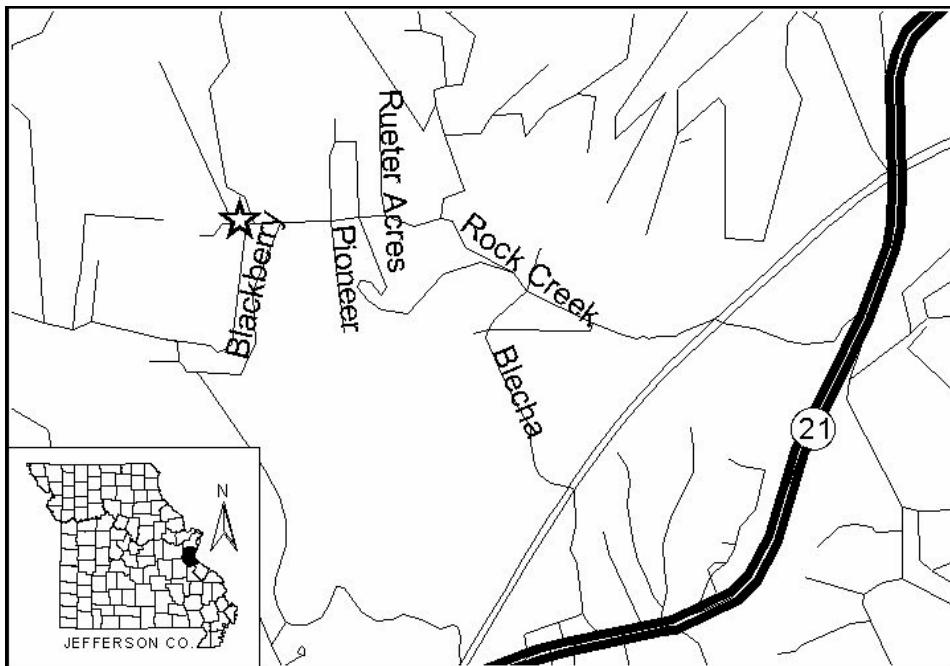
death certificates, hospital discharge, special health care needs, and neonatal intensive care unit data.

Investigation by the Missouri Department of Health and Senior Services determined that no private drinking water wells are located within 3 miles downgradient from the site. Interviews with area residents failed to uncover any patterns of adverse health effects consistent with exposure to chemicals known to be present at the site. However, in the past, significant exposure occurred to individuals using the public water supply. In addition, a new municipal well field was developed about 2 miles southwest of the site.

Although the remedial action was very effective, a health risk still exists at this site. Levels of TCE in the groundwater are still above the public drinking water standard.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Minker Property



Site Name: Minker Property

Classification: Class 4

Date of Placement: June 14, 1984

Address: West Rock Creek Road, Hillsboro, Jefferson County, Missouri, Maxville Quadrangle

Present Property Owner: State of Missouri

Lead Agency: DNR

Waste Type: 2,3,7,8-TCDD (dioxin)

Quantity: Not determined

Site Description:

In 1971, dioxin-contaminated still bottoms, presumably mixed with oil, were used as a dust suppressant in a horse arena. In 1972, dioxin-tainted soil from the horse arena was excavated and used as fill material in residential areas, including the Minker, Stout and Cashel residences. About 120 cubic yards of contaminated soil were placed in a ravine immediately next to the Minker house. Eventually, fill material eroded out of the ravine into Romaine Creek. A removal action

was implemented to remove the dioxin-contaminated soil from each of the affected properties. One of these properties, the former Minker Property, remains listed on the Registry due to dioxin contamination remaining at depth. The other properties that made up the site were cleaned to health-based screening levels and were removed from the Registry in 1990.

Environmental Problems and Areas of Concern Related to Site:

The site should pose no environmental problems, since the dioxin contamination remains at depth and is covered by 4 feet of clean soil. The site will continue to be monitored and maintained to prevent potential erosion. The fence surrounding the site was repaired and a house has been boarded to control access to the site.

Remedial Actions at Site:

In 1988, the U.S. Environmental Protection Agency (EPA) completed the entire Minker/Stout cleanup. Dioxin-contaminated material from each of the separate properties that make up the entire Minker/Stout Site were excavated and placed on site in five storage buildings.

This specific sub-property, referred to as the Minker Property, was excavated to a 4-foot depth before bedrock was encountered and excavation halted. Post-excavation sampling of this area showed levels of dioxin as high as 266 ppb remained. The excavated area was filled in and capped with clean top soil. Permanent survey markers were then installed to delineate this area where contamination was left at depth. Erosion control walls were also constructed in the area where the contamination remains.

The Minker/Stout Site is one of 27 eastern Missouri dioxin sites subject to a Consent Order entered in Federal Court on December 31, 1990. In accordance with the Consent Decree, a thermal treatment unit was constructed at Times Beach and used to treat the dioxin-contaminated materials from this site. This included 26,420 tons of bagged materials, which were delivered to the Times Beach Thermal Treatment Facility between December 1996 and February 1997. Storage buildings were removed, and site restoration is complete.

General Geologic and Hydrologic Setting:

The site is located in an upland area, with steep slopes adjacent to streams. Surface drainage from the site enters Romaine Creek, which loses water to the subsurface.

The surficial materials beneath the site consist of several feet of wind-deposited, silty clay, or loess, over stony clay that was derived from the weathering of bedrock. The bedrock is deeply-weathered limestone.

Water-tracing studies indicate that water lost to the subsurface in the upper reaches of Romaine Creek reemerges at two springs in the lower portion of the watershed. The water first reemerges at Mastis Spring, located about 1 mile north of the site. A portion of the water discharged from Mastis Spring is, in turn, lost to the subsurface, emerging at Bubbling Spring, about 1 mile farther downstream.

Public Drinking Water Advisory:

Most area residents are served by Jefferson County Public Water Supply District No. 3, which purchases water from St. Louis County Water Company. The site is located near Romaine Creek, a tributary of the Meramec River, which serves as the source of water for St. Louis County Water Company. A water company intake is 7 to 8 miles downstream from the site. The nearest public well serves Valley Acres Mobile Home Park. This well is located about 1.5 miles southeast of the site. In addition, some private wells may be located in the area. The site poses little threat to public water systems, but could potentially affect nearby wells.

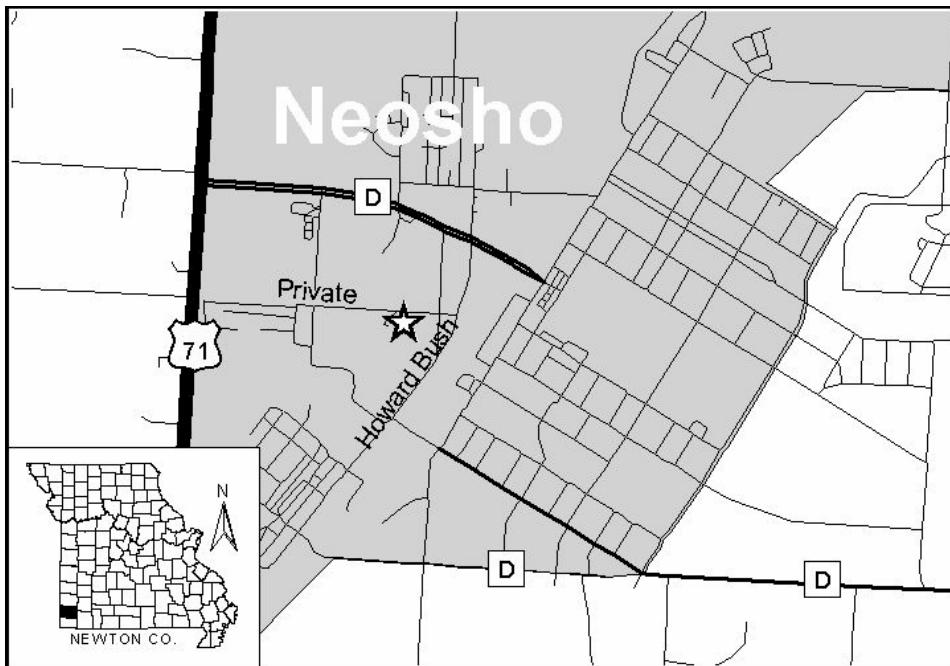
Health Assessment:

Dioxin is one of the most toxic substances known; however, its toxicity varies greatly between species. Animal studies have shown that dioxin produces acnegenic, fetotoxic, teratogenic, mutagenic, carcinogenic, and immunogenic effects. In humans, it is known to have an acnegenic effect (chloracne). It is also suspected to cause soft tissue sarcoma, non-Hodgkin's lymphoma, Hodgkin's disease, and porphyria cutanea tarda.

Due to the residual dioxin contamination at depth, the Missouri Department of Health and Senior Services recommends that this site continue to be monitored to prevent potential erosion and disturbance, and therefore exposure to dioxin. The houses that remain have become deteriorated to the point that they represent a health threat to trespassers who frequent the area.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Neosho Digester and Trenches



Site Name: Neosho Digester and Trenches

Classification: Class 4

Date of Placement: January 9, 1984

Address: Neosho, Newton County, Missouri, part of NE 1/4, NE 1/4, Sec. 16, T. 24N, R. 32W, Neosho West Quadrangle

Present Property Owner: City of Neosho

Lead Agency: EPA

Waste Type: 2,3,7,8-TCDD (dioxin) and 2,4,5-trichlorophenol

Quantity: Not determined

Site Description:

The Neosho Digester Site is an abandoned concrete sewage digester used in the past by the Fort Crowder Military installation. In 1971, 225,000 gallons of dioxin-contaminated rinsewater and wastewater from the Northeastern Pharmaceutical and Chemical Company (NEPACCO) in Verona was deposited into the digester for use in treatability studies conducted by the

wastewater school. In 1978, scrap material was dumped into the digester, causing it to overflow on the north and east sides. A trench was excavated next to the digester, and the spilled material was buried in the trench. In 1981, sampling of the digester documented dioxin at concentrations up to 60 parts per billion (ppb) and 2,4,5-trichlorophenol (TCP) at concentrations up to 250,000,000 ppb in the center and at the bottom of the digester at a 20.5 to 24 foot depth. The digester was capped by the city of Neosho in order to prevent water infiltration and exposure. A recently repaired chain link fence restricts access to the site. Areas of poor vegetation have had new growth established.

This site is located about 3 miles south of Neosho, Missouri, in a relatively rural area. About 70 farmhouses are located within a 7-mile radius of the site.

Environmental Problems and Areas of Concern Related to Site:

The possibility for contamination of groundwater exists due to permeability of the soils. Surface water contamination from erosion is also a possibility.

Remedial Actions at Site:

The city of Neosho capped the trench area. Subsurface investigations were conducted to determine engineering properties of subsurface soils. In June 1988, the U.S. Environmental Protection Agency (EPA) drilled at an angle underneath the digester to check for dioxin contamination in the soil below the digester. No dioxin was detected in the samples collected, demonstrating that no leaks or cracks are present at the base of the digester. About 0.5 ppb of dioxin was found in the trench to the east of the digester. The city of Neosho has a consent order from the EPA to maintain the clay cap. No cleanup or groundwater monitoring is planned at this time.

General Geologic and Hydrologic Setting:

The site is located in an upland setting with surface drainage to the west. The topography and geology are typical of the Springfield Plateau.

Soils range from silty clay to silty and clayey gravel. Bedrock is Mississippian-age, cherty limestone. Permeability in this limestone is high along solution-enlarged openings. Springs and losing stream segments are located in the upland drainages. However, sinkholes have not been observed in the vicinity of the site, and no record exists of catastrophic sinkhole collapse in the immediate area.

Water lost to the subsurface recharges the shallow aquifer, which consists of cherty limestone. This aquifer is used as a water supply for individual homes in rural areas. It is separated from the deeper aquifer by a confining layer, the Chattanooga Shale. The deeper aquifer is the source of some public water supplies in the area, and it is also tapped by some of the deeper private wells.

Rainfall in the area near the digester percolates through the underlying gravelly soil

and migrates through fracture openings into bedrock. Some of the water is later discharged at nearby springs, and some might be pumped from wells that are open to the shallow aquifer. Any water-soluble or liquid contaminants present outside the digester would follow the same pathway. The deeper aquifer has not likely been affected; however, connections between the upper and lower aquifer may exist due to the presence of wells that are open to both aquifers.

Public Drinking Water Advisory:

Several wells are serving small businesses 1 mile west of the site along Highway 71. Little is known about some of these wells. Some are known to be 400 to 600 feet deep, with as little as 60 feet of casing. Private wells may also be located in the area. The threat to these local wells is unknown, but no threat is posed to the city of Neosho's water supply.

Health Assessment:

Dioxin is one of the most toxic substances known; however, its toxicity varies greatly between species. Animal studies have shown that dioxin produces acnegenic, fetotoxic, teratogenic, mutagenic, carcinogenic, and immunogenic effects. In humans, it is known to have an acnegenic effect (chloracne). It is also suspected to cause soft tissue sarcoma, non-Hodgkin's lymphoma, Hodgkin's disease, and porphyria cutanea tarda. Acute poisoning with 2,4,5-trichlorophenol causes decreased activity, motor weakness, and possibly convulsive seizures.

Dioxin is not leaking from the digester. Based on available information, a threat to the public health does not exist at this time.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Overnite Transportation



Site Name: Overnite Transportation

Classification: Class 4

Date of Placement: January 22, 1992

Address: 7455 Hall Street, St. Louis, Missouri, T. 3N, R. 7E, Granite City, Illinois-Missouri Quadrangle

Present Property Owner: Overnite Transportation Company, a Virginia Corporation

Lead Agency: EPA

Waste Type: 2,3,7,8-TCDD (dioxin)

Quantity: Not determined

Site Description:

The Overnite Transportation Site is located in an industrial area of the city of St. Louis. The property was owned formerly by Pacific International Express. While owned by Pacific International Express in the late 1960's and early 1970's, the gravel lot was sprayed on several occasions with waste oil for dust suppression. Some of this oil was contaminated with dioxin. In the early 1980's,

levels of dioxin above 1 part per billion (ppb) were detected in the sprayed areas. After the Overnite Transportation Company acquired the property in 1981, the contaminated lot was capped with a 6-inch asphalt cover. The site covers about 435,382 square feet, of which 66,000 square feet are covered by buildings or other obstructions. According to the Environmental Protection Agency (EPA), the original trafficways were concrete pads. Asphalt was filled in around the concrete pads prior to applying the cap. A recent inspection by department personnel indicated that part of the site has recently been resurfaced. The property is fenced, and a guard is present when the terminal is not open. Generally, the yard operates 24 hours a day.

Environmental Problems and Areas of Concern Related to Site:

The overall condition of the cap is good. However, long-term deterioration of the asphalt cap could be cause for concern if the asphalt cap is not well maintained.

Remedial Actions at Site:

In October 1983, Overnite was ordered by the Missouri Department of Natural Resources to complete EPA-approved remedial actions at

its facility. These actions consisted of applying a layer of asphalt directly over existing pavement and applying crushed rock where no pavement was present. In 1990, the EPA completed additional sampling, collecting a total of 843 samples across the site. Of these 843 samples, 675 had no detectable levels of dioxin; however, dioxin concentrations above 1 ppb were found in 31 samples.

This site is one of 27 eastern Missouri dioxin sites subject to a Consent Decree entered in Federal District Court on December 31, 1990. In accordance with the Consent Decree, a thermal treatment unit was constructed at Times Beach and used to treat the dioxin contaminated materials from this site.

EPA completed an Engineering Evaluation/Cost Analysis (EE/CA) on July 21, 1995. The purpose of the EE/CA was to select the remedy and cleanup criteria for the 27 eastern Missouri dioxin sites. The cleanup criterion set for industrial and commercial sites such as Overnite Transportation was 20 ppb.

The dioxin levels were below the 20 ppb level at which excavation would be required. The property owners will be required to maintain the cap in perpetuity.

General Geologic and Hydrologic Settings:

The Overnite Transportation Company facility is located 0.5 miles west of the Mississippi River on the western edge of the flood plain. The site is protected from the river by an Army Corps of Engineers flood wall. The topography is flat and the landscape is dominated by industrial development. The entire lot surrounding the terminal building is paved with asphalt and concrete.

Surficial materials along Hall Street are a mixture of fill, alluvium and alluvial-type soils. The fill is composed mainly of construction debris, dumped in low-lying areas during the 1930's. Detailed locations of fill are unknown. The Mississippi River valley alluvium in the vicinity of the site is expected to be 45 feet thick or less. Materials directly beneath the site are reportedly natural, and consist mostly of silt with some sand. Coarser sands are expected to predominate at depth.

Permeability values across the flood plain can change significantly from layer to layer, especially in the near-surface units. Detailed investigation is needed to evaluate subsurface conditions at the site, but soil permeabilities are expected to be moderate to high.

Bedrock beneath the site is Mississippian-age Ste. Genevieve Limestone, which is a massively-bedded, sandy, clastic limestone, with some layers of chert and some sandstone lenses occurring locally. The Ste. Genevieve Limestone, and a sequence of similar Mississippian-age carbonates beneath it, are not favorable for the development of drinking water wells. High concentrations of naturally-occurring, dissolved solids in the area render the bedrock aquifers useless for most purposes.

The water table is less than 20 feet from the ground surface at normal river levels. Dioxin contamination is not expected to move readily down into the groundwater. If dioxin-contaminated particles should reach the groundwater, they may migrate eventually through the alluvium into the Mississippi River. However, contaminants in the shallow groundwater system would probably take several years to enter the river.

Public Drinking Water Advisory:

Drinking water to area residents is provided by the city of St. Louis, which obtains water through intakes on the Mississippi and Missouri Rivers. The water intake on the Mississippi River is located upstream of the Overnite Transportation Site. Groundwater in the area is of poor quality and is not known to be used for drinking purposes. The risk to drinking water systems in the area is, therefore, minimal.

Health Assessment:

Since the dioxin at the site is underneath an asphalt cap, there is currently no exposure. Potential exposure routes to the dioxin at this site include any or all of the following: ingestion of the contaminated soil, inhalation of contaminated dust particles, and dermal contact with the contaminated soil or dust. Contamination of surface water and

groundwater is unlikely because of the asphalt cap over the soil.

Dioxin is one of the most toxic substances known; however, its toxicity varies greatly between species. Animal studies have shown that dioxin produces acneogenic, fetotoxic, teratogenic, mutagenic, carcinogenic, and immunogenic effects. In humans, it is known to have an acneogenic effect (chloracne). It is also suspected to cause soft tissue sarcoma, non-Hodgkin's lymphoma, Hodgkin's disease, and porphyria cutanea tarda.

If the use of this site were to change or the surface excavated or graded, and contaminated soil became exposed, exposure to dioxin-contaminated soil could occur. There is no risk at this site as long as the asphalt cap is maintained.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Pigeon Hill Landfill



Site Name: Pigeon Hill Landfill

Classification: Class 4

Date of Placement: June 14, 1984

Address: Ten miles south of St. Joseph, bordering the Northeast corner of the Pigeon Hill Wildlife Area, SE 1/4 of the SW 1/4 of Sec. 12, T. 56N, R. 35W, St. Joseph, Buchanan County, South Quadrangle

Present Property Owner: Frank Norris, Buchanan County (Trustee)

Lead Agency: DNR

Waste Type: Aluminum, barium, iron, manganese, cadmium, chromium, copper, nickel, zinc, calcium, magnesium, and sodium, pesticides, volatile organic compounds, and semi-volatile organic compounds

Quantity: About 100 tons of industrial wastes.

Site Description:

The site consists of a 36-acre, closed municipal sanitary landfill. Partially wooded ridges and valleys are present to the north

and south. The site is directly north and adjacent to the Pigeon Hill Wildlife area. It is contaminated with heavy metals, pesticides, solvents and various inorganic wastes. Leachate from the closed portion of the landfill has polluted surface water to the south and east of the site. Surface water near the leachate seep has contained a variety of heavy metals, as well as acetone, xylene, parathion, chlordane, heptachlor, carbon disulfide, 2,4-D, 2,4,5-T, hexachlorobenzene, cyclohexane, pyrene, fluoranthene, nickel, bis (2-ethylhexyl) phthalate, 2,4-dichlorophenol, and numerous unknown chemicals from steel treating and pesticide manufacturing. In all, more than 100 tons of industrial wastes were deposited at the site. Buchanan County took ownership of the property when the previous owner, Frank Norris, failed to pay taxes.

Environmental Problems and Areas of Concern Related to Site:

Potential for surface and groundwater contamination exists at the site. The site is located next to the state-owned Pigeon Hill Wildlife Area. Leachate seeps have previously discharged considerable amounts of leachate into a stream in the Pigeon Hill Wildlife Area. Erosion of the landfill continues to be a concern.

Remedial Actions at Site:

A Notice of Violation was issued to the owners by the Missouri Department of Natural Resources in August 1990, due to the amount of leachate leaving the site. During 1991, the case was referred to the Attorney General's Office. The city of St. Joseph initiated efforts to correct the on-site leachate problems. The department's Solid Waste Management Program (SWMP) and Kansas City Regional Office were involved with actions to correct problems at the site. A pond to collect runoff was constructed in August 1995 near the east fence line. Since then, about one million gallons of water have been pumped from the collection pond and taken to St. Joseph's wastewater treatment plant. Fencing around the site is complete, including new fence work along the wildlife area border. The SWMP and the city of St. Joseph developed a closure plan for the site.

A January 21, 1998, report by the SWMP found that the closure plan was not being properly implemented. The city of St. Joseph committed to implementing the landfill closure plan approved by the SWMP. During fiscal 1998, landfill cover was applied, a gully was filled, access roads were built, a berm was constructed, and a leachate collection pond was repaired.

During 1999, the final soil cover was applied to the landfill. Grading, shaping and smoothing were completed, and a grass seed mixture and straw mulch were applied. A vegetative cover has been established. Leachate is being collected, pumped and hauled to the city of St. Joseph for treatment. Leachate is no longer leaving the site and flowing into the Pigeon Hill Wildlife Area. A stormwater detention basin was constructed during 2000 in the southern area to contain erosion prior to discharge to the Pigeon Hill Wildlife area.

The department's SWMP has determined that all closure and enforcement requirements for the Pigeon Hill Landfill have been met and has closed its enforcement case against the landfill. The city of St. Joseph must continue to follow its management plan to repair the landfill cover when needed and prevent leachate from leaving the landfill property.

Class 4 Sites

General Geologic and Hydrologic Setting:

In general, the soils at this site were initially characterized by about 20 feet of loess underlain by variable thicknesses of glacial till. However, site disturbance has resulted in the alteration of natural conditions. Unconsolidated material present directly beneath the landfill is expected to consist of about 0 to 10 feet of silty clay, underlain by sandy clay at depths of 10 to 15 feet below the surface. The sandy clay reportedly contains interbedded sands, ranging from 1 to 6 feet in thickness, present at depths of 25 to 70 feet below the surface. These interbedded sand lenses do contain appreciable amounts of shallow groundwater and could be affected by site contamination if located next to trenches or the surface drainage.

The uppermost bedrock beneath the site is the Amazonia Limestone. Because the till and underlying bedrock typically display very low permeability, there is little likelihood that contaminants will migrate into deep groundwater supplies. Furthermore, deep groundwater supplies in this area are normally marginal in quantity and quality.

Shallow, large-diameter dug wells possibly did exist or are present on or near the facility. If abandoned wells have not been properly plugged, groundwater supplies could be affected by contaminant migration down boreholes.

Public Drinking Water Advisory:

No public water systems exist in the area. Nearby residents use private wells, which are potentially threatened by contamination from the site.

Health Assessment:

Ingestion, inhalation and dermal contact by a variety of pathways are the possible routes of human exposure at this site. Numerous chemicals, including some carcinogens, have contaminated surface water. The aquifer beneath the site is at risk and may be contaminated. Inhalation and direct contact are possible if waste were to be exposed by erosion of the soil cap.

Soil samples collected by the EPA identified a variety of hazardous wastes. Other chemicals, for which no concentrations were given, were dumped at the site. Symptoms of exposure to these chemicals may range from mild, transient effects to permanent damage and death.

The following are the major contaminants of concern found at the site: arsenic, barium, bis (2-ethylhexyl)phthalate, cadmium, chromium, fluoranthene, manganese, nickel, pyrene, 2,4-dichlorophenol, and zinc. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

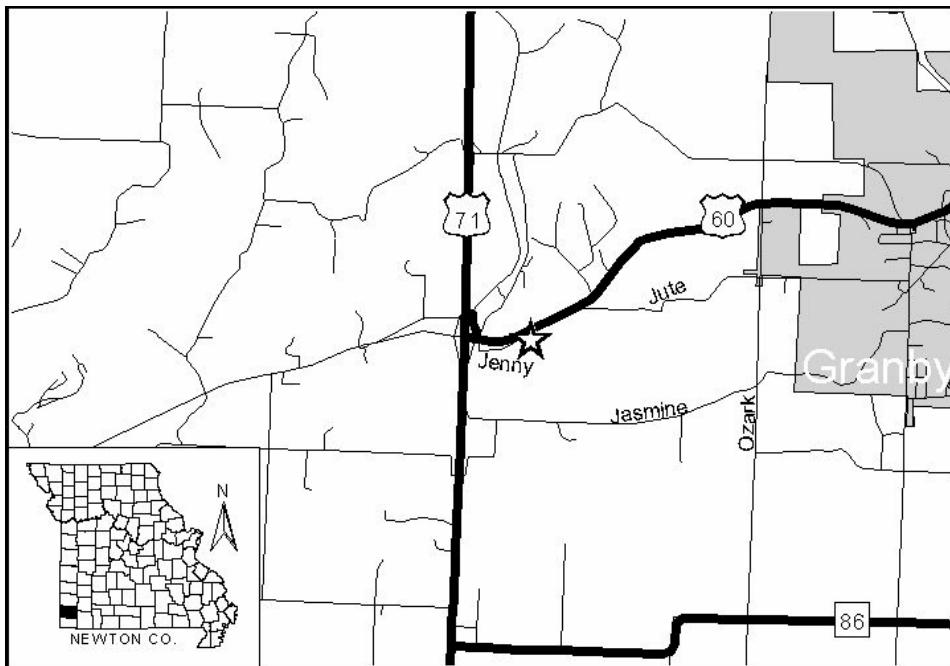
Significant exposure from direct contact is possible at the site because of its location next to the Pigeon Hill State Wildlife Area. The wildlife area is used for hunting, fishing,

hiking, mushroom hunting, target practice and organized events. Sections of the wildlife area are currently being restructured. Tree removal and grading is occurring directly next to the landfill. Installation of a new fence along the southern site boundary should help to reduce the number of wildlife area users who come into contact with the site. Some nearby residents use private wells, which are potentially threatened by the site.

Based on available information - the toxic and carcinogenic nature of some of the materials present, the known off-site contamination, and the potential groundwater contamination - a serious health threat exists at this site.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P.O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

R & O Processors



Site Name: R & O Processors

Classification: Class 4

Date of Placement: October 10, 1991

Address: About 3 miles west of Granby on Highway 60 in Newton County, Missouri, NE 1/4, NW 1/4, Sec. 10, T. 25N, R. 31W, Granby Quadrangle

Present Property Owners: Robert W. Moffet

Lead Agency: EPA

Waste Type: Heavy metals and cyanide

Quantity: Not determined

Site Description:

The R & O Processors Site is located in a rural, light industrial area. The site is an abandoned metal finishing facility that conducted business from 1981 to 1990. During this period of operation, the company performed various metal finishing processes, including zinc, brass, copper, chromium and nickel plating. In 1990, the owners of the facility and property filed both business and personal bankruptcy and abandoned the

facility. The Missouri Department of Natural Resources documented about 30,000 gallons of plating waste and sludge, characterized as hazardous waste, abandoned in concrete tanks, vats and drums at the site. Building structures, equipment and surface soils were also contaminated.

About 50 residences are located within 1 mile of the site, and 25 residences are within one-half mile.

Environmental Problems and Areas of Concern Related to Site:

Potential shallow groundwater contamination is of concern; however, the sources of contamination have been removed. The closest residence is adjacent to the site and within 50 yards of the process building. This residence and most of the surrounding residences obtain water from private wells.

The site is near Shoal Creek which the state has designated as a Whole-body Contact Recreational.

Remedial Actions at Site:

In December 1990, the department requested that the U.S. Environmental Protection

Agency (EPA) inspect the site for a potential removal cleanup under the federal Superfund program. The EPA conducted a removal assessment in 1991, and determined that the surrounding population, surface waters, and groundwater were threatened by several hundred drums, tanks and vats of plating process waste, containing dangerous levels of heavy metals and cyanide. Included in these wastes were spent acidic stripping and rinse solutions, and caustic, sludge byproduct wastes.

In November 1991, EPA contractors began the removal operation. Twenty waste streams, totaling 600 drums, were segregated and staged for disposal. A total of 1,220 tons of contaminated soil waste was excavated and landfilled off site. The site was restored by the application of 750 cubic yards of topsoil, followed by seed and straw. Fifty tons of scrap metal were decontaminated on site and shipped to a local scrap dealer. Contaminated scrap wood (mostly pallets) was shredded on site and blended with contaminated soil for disposal. The on-site operations building was sandblasted and pressure washed. Twenty thousand gallons of generated wastewater were disposed off site. These removal activities were completed in March 1992 and the final drums of waste were transported from the site in April 1992.

General Geologic and Hydrologic Settings:

The R&O Processors Site is located on a ridgeline, where the topography is nearly flat to gently sloping. Surface runoff flows to Dry Branch or another unnamed tributary of Shoal Creek. Shoal Creek, which is a gaining stream, is located about 1.5 miles northwest of the site. Many of the tributaries to Shoal Creek lose flow to the subsurface.

Surficial materials are expected to be 30 to 40 feet thick and consist mainly of cherty, red clay residuum. The residuum is a weathered product of the underlying cherty limestone bedrock and exhibits typically a moderate to high permeability. The chert content of the residuum varies, but it is often present as a relict structure, retaining its stratigraphic position.

Bedrock beneath the site is Mississippian-age Burlington-Keokuk Limestone, a medium- to coarse-grained limestone with chert beds and nodules. Weathering of the bedrock has resulted in solution-enlarged fractures, bedding planes, caves, sinkholes and springs. Such karst features have been observed in the area, but are not known to exist beneath the site.

The uppermost aquifer comprises the Burlington-Keokuk Limestone and the underlying Elsey and Reeds Spring Formations. All of these units are cherty limestones. Together, these units have a thickness of about 265 feet beneath the site. Shallow groundwater flow is expected to be to the northwest toward Shoal Creek. Most private water supply wells use the uppermost aquifer. The upper aquifer is separated from the lower aquifer by a confining unit composed of the Mississippian Northview Formation and Compton Limestone and the Devonian Chattanooga Shale. The lower aquifer includes Cambrian and Ordovician formations composed of sandstones and cherty dolomites. Water wells that require higher yields, such as community wells, must tap the deeper aquifer, which is hundreds of feet thick.

Public Drinking Water Advisory:

The city of Granby is served by three deep wells, which are located 2.5 to 3 miles east and are not affected by the site. Two wells, which formerly served Vern's Chuckwagon Restaurant at the junction of Highway 71 and Highway 60, are 0.3 miles west of the site. It is unknown if these wells are affected by the site. Four wells serving the Evergreen Park Subdivision are located 0.3 to 0.6 miles northeast. The department's Public Drinking Water Program issued a notice of violation to the subdivision for exceeding the EPA's drinking water standard, the maximum contaminant level (MCL), for cadmium. The subdivision has also exceeded the action level for lead in the drinking water. This exceedance is most likely due to historic lead and zinc mining activities in the area, since data from other mining sites in Missouri have concluded that metals can migrate one-fourth to one-half mile from a mine void. The

department has concluded that the exceedances are not attributable to the R&O Processors Site. Karst topography exists in the area, and the well located on the R&O Processors property is contaminated. The risk to public water systems is unknown. However, the site does pose a threat to shallow groundwater and to nearby private wells.

Surface water drainage from the site flows to Shoal Creek, which is the source of drinking water for the city of Neosho. The intake structure is located slightly more than 3 miles west of the site. Should it be determined that contaminants are migrating to off-site surface waters, the potential impact on Shoal Creek and the Neosho water system should be further evaluated.

Health Assessment:

Following the removal and clean-up of the site, cadmium levels exceeding the site soil action level were detected only in the concrete sampled from the walls and floors of the sludge-storage vats. Should the concrete not stay intact, exposure to contaminants may

occur via ingestion, inhalation and dermal contact with contaminated dust.

Cadmium is a known animal carcinogen and a suspected human carcinogen. It attacks the lungs, kidneys and blood. It also produces teratogenic effects.

Samples of a residential well located less than 200 feet west of the R&O Processors operations building were collected April 2001 by the Missouri Department of Health. Lead, cadmium and zinc were found in the samples. The level of zinc was within the limit allowed in public water supplies, but the levels of lead and cadmium exceeded allowable limits. A recommendation was made that the homeowner install a filtration unit capable of removing heavy metals, use bottled water, or hook up to a public water supply. Private wells in the area will continue to be monitored to ensure this remains an unlikely exposure pathway.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Rheox, Inc.



Site Name: Rheox, Inc.

Classification: Class 4

Date of Placement: April 14, 1992

Address: 5548 Manchester Avenue,
St. Louis, Missouri, Webster Groves
Quadrangle

Present Owners: Elementis Specialties

Lead Agency: DNR

Waste Type: Lead

Quantity: Not determined

Site Description:

The Rheox Site is located in an 8.33 acre industrial and commercial area at the southwest corner of the intersection of Macklind and Manchester Avenues. Bordered by two railroad tracks to the south, it is long and narrow and relatively flat. General drainage flows to the south. Several public parks are located within a three-mile radius. Rheox Inc. currently operates a manufacturing plant at the site that was operated by National Lead Industries (NL). NL owned and operated

the site for over 100 years. During past production years, NL fabricated a variety of lead products and conducted lead pigment production processes. The current facility does not use lead in any production process.

The Missouri Department of Natural Resources documented high lead contamination in the soil on the property. Contamination is a direct result of past manufacturing or disposal practices in an area now used as a parking lot. Soil sampling analyses indicated lead levels in the soil at concentrations significantly above background and Extraction Procedure (EP) toxicity threshold values, characterizing this material as hazardous. The EP toxicity lead concentrations ranged from 6.6 to 168.4 parts per million (ppm). The entire site is fenced to restrict access, and a security guard is on site.

Environmental Problems and Areas of Concern Related to Site:

Migration of lead waste off site, via surface runoff or shallow groundwater contamination, is a potential concern. Capping has decreased this concern. Minor cracks have developed in the parking lot, but these cracks should be sealed in the near future. The cap is in good overall condition.

Remedial Actions at Site:

During fall 1992, Rheox capped the lead-contaminated parking. A layer of asphalt over an impermeable geofabric liner prevents surface water from percolating through contaminated soils.

General Geologic and Hydrologic Settings:

The Rheox facility is situated in an industrial corridor next to River des Peres. River des Peres is a Mississippi River tributary. As the city grew, the river channel was straightened and the riverbed paved. It is now the main channel for the St. Louis City storm sewer system and is not considered a losing stream since the river channel was paved.

Railroad tracks separate the Rheox Site from the concrete banks of River des Peres. The site is essentially level with only 4 feet of total surface relief. Surface runoff flows into the river or into storm sewer inlets that feed the river.

Lead contamination at the Rheox Site is concentrated in fill material, which averages 6 feet in thickness across the site. The underlying natural soils are clay-rich, with moderate to low permeability. Perched water is present commonly at the fill-soil interface.

Alluvial deposits of the ancestral River des Peres may lie beneath the site. The River des Peres alluvium is not a usable aquifer; the alluvium is of limited extent, it produces insufficient quantities of drinking water, and the water quality is questionable.

Although site-specific boring information is not available, bedrock is expected to be the Pennsylvanian-age Cheltenham Formation. The Cheltenham Formation is made up of consolidated clays with thin, interbedded coal beds. Clay and coal were mined from most of the area surrounding the site. Open or water-filled mine cavities may still be present under portions of the Rheox facility. Mine deterioration has created several collapse features just south of the site, and engineering problems associated with the mining still exist today. Groundwater recharge to the bedrock is limited.

Under present site conditions, groundwater supplies do not appear to be threatened by lead contamination. Groundwater from bedrock aquifers in St. Louis City is generally high in dissolved solids, and no known water wells are in the vicinity of the site.

The main concern is the potential for off-site migration of lead contaminants via surface water runoff. Mobilized lead or lead-contaminated soil particles entering River des Peres may be deposited in sediment traps downstream or may eventually reach the Mississippi River, about 8 miles downstream of the site.

Public Drinking Water Advisory:

Drinking water to area residents is provided by St. Louis, which obtains water through intakes on the Mississippi and Missouri Rivers. Groundwater is poor quality and not known to be used for drinking purposes. The risk to drinking water systems in the area is, therefore, minimal.

Health Assessment:

Exposure to lead can cause a wide variety of symptoms and is difficult to diagnose in the early stages. Exposure can cause fatigue, headaches, anemia, constipation, and aching bones and muscles. Chronic exposure can lead to more severe symptoms, including kidney and nervous system damage. These more severe symptoms may be irreversible, particularly in children.

Currently, there are no complete exposure pathways. This could change if excavation were to occur or if the asphalt cap were allowed to deteriorate. The site, however, is fenced and gated to restrict public access.

Based on available information, a potential health risk exists at the Rheox Inc., facility because of the high levels of lead in the soil.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Sac River Landfill (Murray Landfill)



Site Name: Sac River Landfill (Some early file documents also refer to the site as the Highway 13 Landfill and the Murray Landfill.)

Classification: Class 4

Date of Placement: January 15, 1984

Address: North Highway 13, Springfield, Greene County, Missouri, NE 1/4, Sec. 34, T. 30N, R. 22W, Ebenezer Quadrangle

Present Property Owner: City of Springfield

Lead Agency: EPA

Waste Type: Volatile organic compounds, solvents, pesticides, heavy metals, acids, and cyanides

Quantity: Not determined

Site Description:

This site is a capped, inactive landfill that operated from 1968 to 1974. The landfill is located west of Highway 13 and is adjacent to the Fulbright Landfill. Between 1968 and 1974, industrial waste containing hazardous chemicals and heavy metals was deposited in this landfill. The U.S. Environmental Protection Agency (EPA) has addressed

monitoring and cleanup of the Sac River and the Fulbright Landfills as a single site. The Springfield Northwest Sewage Treatment facility was constructed on the west boundary of the property and became operational in June 1987.

Environmental Problems and Areas of Concern Related to Site:

This landfill is located in the flood plain of the Little Sac River, a tributary of Stockton Lake, north of Springfield. The lake is a major recreational and fishing resource and is used for drinking water. Groundwater could become contaminated due to the thin, cherty, red clay soils and numerous springs and sinkholes in this area. Several private wells are located near the site. This site has many of the same concerns as Fulbright Landfill.

Remedial Actions at Site:

On March 13, 1986, the EPA issued a Consent Order under Section 106 of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 to the city and other Potentially Responsible Parties (PRPs). The Consent Order required the PRPs to conduct a Remedial Investigation/Feasibility Study (RI/FS), under the oversight of the EPA, on both the Sac River and

Fulbright Landfills. Both landfills were operated by the city and received municipal and industrial wastes.

A Geophysical Investigation Report was released in June 1986 and used for final revisions on the groundwater monitoring network installed later in the RI. The PRPs began installation of the monitoring wells in July 1986. Sample collection and analysis was completed in May 1987. The PRPs collected two rounds of environmental samples. A series of 22 monitoring wells, in both alluvium and shallow bedrock, were installed in the RI. EPA validated the data.

In September 1988, the EPA signed a Record of Decision (ROD) selecting remedial actions for the adjacent landfills. Remedial actions for the site consist of the following:

1. Deed restrictions were placed on the property, controlling future uses.
2. Ground and surface water samples from the site will be collected and analyzed on a regular basis as part of a long-term monitoring plan.
3. A contingency plan is being developed for leachate control if leachate is found to be a significant or continuing problem.

Pursuant to the EPA Consent Decree, PRPs continue to operate and maintain both landfills. The EPA completed two Five-Year Reviews of the remedial action addressing both landfills, and found that the remedial action continues to be protective.

General Geologic and Hydrologic Setting:

The site is located on the flood plain of Little Sac River. Soils consist of silty clay, overlying gravel and clay. Bedrock is composed of Burlington Limestone. The Burlington Limestone is deeply weathered in many locations in the Springfield area, but, at this location, appears to be less weathered and less permeable.

The principal concern is the shallow migration of contaminants off site through alluvium into the Little Sac River. Soils are permeable, and the shallow water table is anticipated to fluctuate rapidly in response to recharge by rainfall. Bedrock aquifers are not anticipated to be affected significantly.

Class 4 Sites

Public Drinking Water Advisory:

Fulbright Spring, one source used by the Springfield water supply, is within 2 miles of the site. Wells serving Fantastic Caverns, Crossroads General Store, the city's Northwest Sewage Treatment Plant, and several private residences are also located within 2 miles. Releases from the site were observed. The site continues to represent a potential threat to area water systems due to the hydrology of the Springfield area.

Health Assessment:

Routes of exposure include the possibility of ingestion of contaminated groundwater; direct body contact with, and ingestion of, Little Sac River water or its aquatic organisms; ingestion of, or dermal contact with, exposed leachate from the landfill; and inhalation of volatilized chemicals. The ingestion route is a major concern because the site could potentially affect groundwater used by area residents.

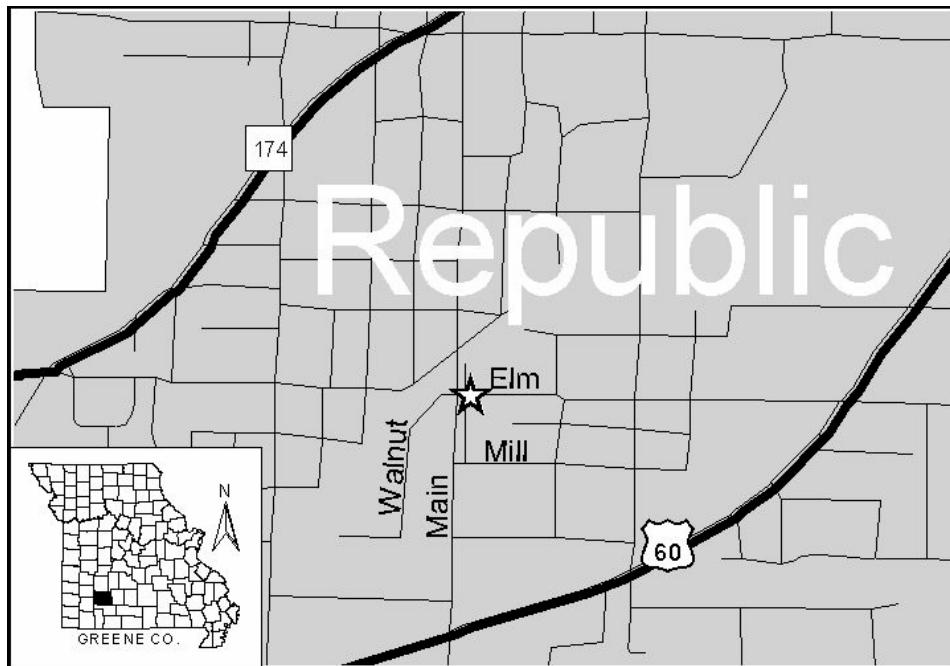
Major contaminants of concern found at the site are: chlorobenzene, ethylbenzene, benzene, bis(2-ethylhexyl)phthalate, toluene, cyanide, barium, cadmium, chromium, lead, nickel, and manganese. Please refer to the Health Assessment Chemical Table in Appendix A for potential adverse health effects associated with these contaminants.

EPA testing of private wells in the area (November 1988) found only one volatile organic chemical (methylene chloride) above the detection limit (5.0 ppm). Sampling by the Missouri Department of Health and Senior Services has occasionally identified trace levels of contamination that may be related to the site. No contaminants were detected in the most recent sampling in June 2002.

Based upon available information, a public health risk may exist at this site. Due to the toxicity of chemicals present and the possibility of future exposures, the site should continue to be monitored and maintained.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Solid State Circuits



Site Name: Solid State Circuits

Classification: Class 4

Date of Placement: February 22, 1985

Address: Southeast corner of the intersection of Elm and Main Streets, Republic, Greene County, Missouri, Brookline Quadrangle

Present Property Owner: James Don Rogers

Lead Agency: DNR

Waste Type: Trichloroethylene (TCE)

Quantity: Not determined

Site Description:

The Solid State Circuits Site (SSC) covers 0.5 acres in downtown Republic and consists of a fenced, regraded, landscaped area with some new buildings. Air strippers operate in one new on-site building. The remaining portion of the old SSC building was given a facelift in 2001.

A fire destroyed the northern portion of the old SSC building in 1979. Rubble was pushed into the basement and the area covered for use as a parking lot. The building's basement contained a well that served as a pathway for TCE to enter groundwater. After TCE was detected in Municipal Well No. 1, the northern portion was reopened and extensive contamination was discovered.

Environmental Problems and Areas of Concern Related to Site:

Three groundwater systems underlie the site: (1) the Unconsolidated/Fractured Shallow Bedrock System (UFSB), (2) the Shallow Bedrock Aquifer (SBR), and (3) the Deep Bedrock Aquifer (DBR). All three have been contaminated with volatile organic compounds, primarily TCE. The DBR is the primary source of drinking water for the city of Republic. The basement well in the old SSC building served as a direct pathway for TCE to enter the DBR.

Of Republic's three original municipal wells, only Municipal Well No. 1 was closed due to TCE contamination. To date, this was the only well impacted by TCE. Since no private wells exist near the site, no one is being currently exposed to contaminated

groundwater. Municipal Well No. 2, located 2,100 feet east-southeast of the site, was closed in the fall of 1997. Municipal Well No. 3 is 4,900 feet northeast of the site. Municipal Wells Nos. 4 and 5 were constructed and brought on-line by 1988. Municipal Wells Nos. 3, 4 and 5, which draw water from the DBR, serve the city and are monitored regularly by Missouri Department of Natural Resources personnel.

Remedial Actions at Site:

Following identification and confirmation of the contamination source, the department and the Environmental Protection Agency (EPA) completed removal actions. More than 2,000 cubic yards of contaminated material from inside the basement foundation was excavated and disposed at a permitted hazardous waste disposal facility. The basement's well, which served as a conduit for contaminant migration, was plugged to prevent the further spread of contaminants.

A Remedial Investigation/Feasibility Study (RI/FS) was completed by SSC with department oversight in the summer of 1989. The RI identified plumes of TCE contamination in the groundwater in each of the three hydrologic systems underlying the site.

On August 14, 1989, the RI/FS and the Proposed Plan were released to the public for review and comment. The FS evaluated four remedial alternatives, including the 'no action' alternative. After considering the public's comments, the EPA, with department concurrence, selected a Remedial Action to be implemented at the site. The Record of Decision (ROD) was signed on September 27, 1989.

The selected remedy in the ROD included: (1) extraction of the contaminated groundwater by using existing and new wells; (2) on-site treatment of the extracted groundwater using the two existing air strippers; (3) discharge of treated water to the city of Republic's sewer system to receive further treatment at the Publicly Owned Treatment Works; (4) a municipal ordinance to prevent construction of drinking wells in or near the contaminated groundwater plumes;

and (5) continued monitoring to determine the effectiveness of the remedy.

The EPA invited SSC to participate in formal negotiations for a settlement to conduct or finance the Remedial Design/Remedial Action (RD/RA) at the site in accordance with the ROD. From December 1989 through May 1990, SSC, the EPA, and the department negotiated the terms of a Consent Decree/Statement of Work (CD/SOW) for the RD/RA. SSC signed the CD on July 2, 1990. It was entered with the court May 31, 1991.

The Pilot Remediation Program, which began in September 1991, consisted of on-site treatment of the extracted groundwater using air strippers. It was completed in January 1992. The removal effectiveness of TCE was determined to be 98 to 99 percent.

In December 1992, the department and the EPA reviewed and approved the Remedial Design proposal for the cleanup of the groundwater. Remedial Action construction began in early 1993 and was completed by SSC with department oversight in December 1993.

Groundwater extraction from each of the three hydrogeologic systems and remediation via the pump and treat system began after construction. In May 1994, the department and the EPA jointly determined that the remedy was operational, functional and performing as designed. The estimated time it will take to remediate the site is 20 to 40 years.

The first Five-Year Review of the SSC Site, completed in 1996, determined that the remedy and ongoing operation, maintenance, and monitoring at the site are still functioning and performing as designed, and continue to be protective of human health and the environment. The second Five-Year Review was completed in Fall 2002.

General Geologic and Hydrologic Setting:

The site is located in a broad, upland setting with regional karst development. Small spring and cave systems exist in and around the city of Republic. Rocks of Mississippian- and Ordovician-age underlie most of the region.

The subsurface geologic units have been divided into three hydrostratigraphic layers: the UFSB, the SBR, and the DBR.

The UFSB includes 10 to 20 feet of stony, red, clay residuum and about 75 feet of Mississippian-age Burlington-Keokuk Limestone, consisting of weathered and fractured, cherty limestone. This zone is moderately to highly permeable, with fractures that have provided avenues of rapid fluid transport to groundwater. Regional groundwater flow of the UFSB is south-southeast toward the Schuyler Creek drainage system. Perched water is thought to be present at the soil-bedrock contact.

The SBR includes the lower, unfractured Mississippian-age Burlington-Keokuk Limestone, which ranges from about 75 feet to 300 feet below the surface. Regional groundwater flow in the SBR is toward the southeast.

The DBR includes deep, Ordovician-age dolomite and sandstone bedrock below a confining unit, which is present at depths of over 300 feet.

All three of the hydrologic systems were affected at this site. Primary routes of contaminant migration are along fractures in the shallow aquifer. The deeper aquifer was contaminated by migration down an abandoned well that penetrated the confining layer.

Public Water Drinking Water Advisory:

TCE from the site has contaminated the groundwater, including the aquifer that serves as the source of water for the city of Republic, via an abandoned on-site well. Two of the three water supply wells for the city of

Republic are located within 4,900 feet of the site. The wells are 1,000 to 1,230 feet in depth, with 300 to 451 feet of casing, and are constructed into consolidated geologic formations. No private wells are located in the vicinity.

Health Assessment:

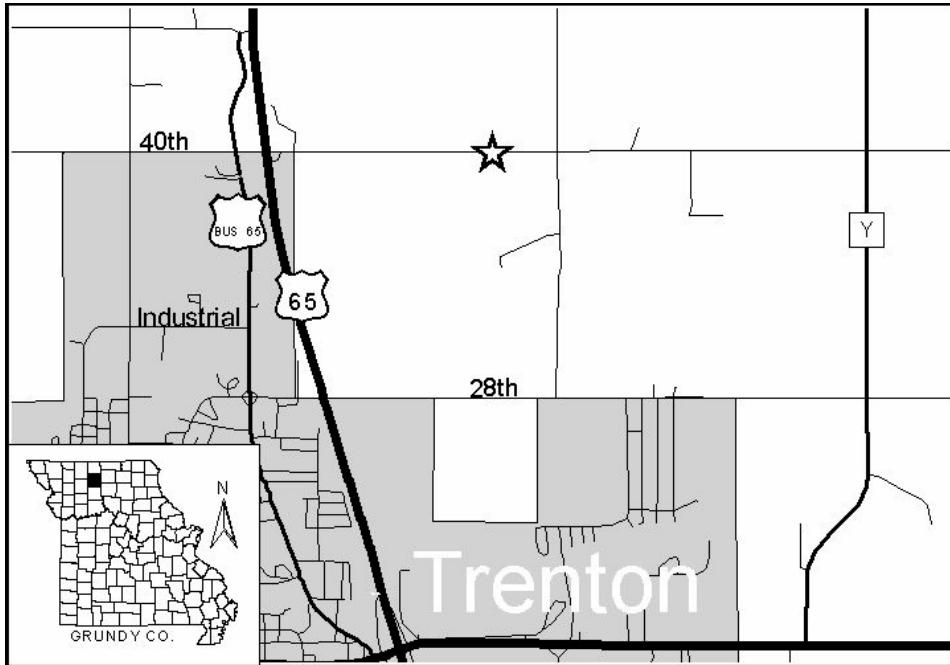
The exposure route of greatest concern is ingestion of contaminated groundwater, although this is not presently known to be occurring. Other routes of exposure could be through inhalation or skin and eye contact.

The predominant health response from exposure to TCE is central nervous system depression. Some indication of injury to the liver and kidneys may also be observed, and TCE has been shown to be carcinogenic in animals. Samples collected in June 2002 by the Missouri Department of Health and Senior Services from private wells at the southern and southeastern edges of town did not detect TCE or its breakdown products. At the present time, it would seem likely that exposure to TCE is limited, but the potential exists for increased future exposure.

A health threat exists at this site due to the carcinogenic nature of TCE, the proximity of the facility to city residences, and the contamination of the city's drinking water supply. At this time, the selected remedy is to pump contaminated water into on-site air strippers. This should reduce the potential for exposure to TCE.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Trenton Landfill



Site Name: Trenton Landfill

Classification: Class 4

Date of Placement: June 10, 1992

Address: Northeast of the city of Trenton, east of Highway 65 in Grundy County, Missouri, NE 1/4, NW 1/4, Sec. 10, T. 61N, R. 24W, Trenton Quadrangle

Present Property Owner: Connie S. Gwinnup and Anthony Clifford Droz

Lead Agency: DNR

Waste Type: Heavy metals, paint waste, and herbicides

Quantity: Not determined

Site Description:

The city of Trenton used this site, which is about 40 acres in total size, as a sanitary landfill from 1959 until its voluntary closure in 1979. Around 1980, the city graded and seeded the site. The property has since been transferred to private ownership. In 1985, elevated levels of heavy metals were documented in Muddy Creek downstream

from the landfill. This discovery prompted the Missouri Department of Natural Resources to investigate the landfill as a potential source. These investigations determined that a large quantity of hazardous waste was disposed of during the life of the landfill. These wastes included chromic acid sludge, paint waste, and herbicides. Today, the property exists as an open field. As part of the stabilization of the site, it was planted with native grasses, trees and forbs.

The property is located in a predominantly rural agricultural area. Access to the site is unrestricted.

Environmental Problems and Areas of Concern Related to Site:

In the past, sediment samples have indicated that hazardous substances from the landfill had impacted Muddy Creek. The site has potential for off-site migration of waste constituents via shallow groundwater. Erosion of the cap and leachate outbreaks have been a concern in the past.

Remedial Actions at Site:

In 1980, the site was graded and seeded. Groundwater monitoring has not been

implemented. Department inspections in 1997 and 1998 indicated that the cap subsided in locations throughout the landfill. It was also noted that two drainage ditches had eroded, one severely, exposing solid waste, hazardous substances, and hazardous waste. Two areas of leachate outbreaks were also noted.

The PRPs and the department agreed to a two-phase stabilization project to address the erosion and the cap. Phase I was completed in July 1999. This phase consisted of an engineered biological design to stabilize the large erosion ditch running along the southern edge into Muddy Creek.

In spring, 2000, a well-established vegetative cover was observed within the boundaries of the drainage ditch and in the areas outside of the stabilized ditch. Evidence of moderate to high flow was noticed in the area of riprap, but no erosion was evident.

The landfill cap was stabilized in the fall of 2000. A site inspection in 2001 found that the site is mostly vegetated with some evidence of erosion and minor surface ponding. Overall, no leachate outbreaks were visible at that time. Subsided areas have been filled in order to halt ponding and surface water infiltration at the site. Grasses were planted in the summer of 2001, and trees were planted in the fall of 2001. The last phase of the project included revegetation of the western half of the site with native and agricultural grasses and enhancement of the riparian corridor by planting trees. In May 2002, department staff inspected Phase II activities and found that the landfill cap was re-vegetated and nearing stability. Tree plantings were complete and surviving. Some minor repairs to the drainage channel and stabilization of two areas of slight rill erosion were identified at that time and later fixed.

General Geologic and Hydrologic Setting:

The Trenton Landfill is located in the Dissected Till Plains physiographic region of northern Missouri. The site encompasses about 40 acres on the western slope of a rolling upland adjoining Muddy Creek, which is located along the western boundary of the site.

Much of Grundy County is covered by glacial drift, which is a heterogeneous, unconsolidated deposit of clay, sand, gravel and boulders. Some of the sands in the lower layers of the till form permeable beds of limited lateral and vertical extent. These lenses are a source of poor-quality drinking water for several wells within 2 miles of the site. The till directly under the Trenton Landfill Site is expected to be more than 100 to 150 feet thick. If groundwater exists in the sand lenses of the lower till beneath the site, it probably flows to the southeast.

The fine-grained, low permeability sediments beneath the site should retard the downward movement of surface water and leachate, reducing impacts to groundwater. However, if sand lenses are present in the till, contaminant movement and migration within groundwater will be enhanced.

Bedrock beneath the landfill is probably shale and sandstone of the Cherokee Group, which is about 435 feet thick at Trenton. Minor amounts of clay, coal and limestone also occur in the Cherokee. In fact, an undulatory bed of coal was mined at the Trenton Mine, one mile southeast of the landfill. In general, the large shale content of most Cherokee strata greatly impedes the flow of groundwater. The basal member of the Cherokee Group is a water-bearing sandstone more than 100 feet thick, and, in southeast Grundy County, water from this layer is suitable for livestock. However, low yields and high dissolved-solids content of the bedrock aquifer make it unsuitable for most uses.

Public Drinking Water Advisory:

The source of drinking water for the city of Trenton is the Thompson River. The Trenton Landfill is located 3.4 miles from the water intake. Drainage from the site flows to Muddy Creek, which enters the Thompson River several miles downstream of the water supply intake. Therefore, the site poses no direct threat to the city's public water system.

Although the site does represent a threat to shallow groundwater, use of groundwater for drinking purposes is very limited, due to the poor quality of the water and the presence of

a rural water district, Grundy County Public Water Supply District (PWSD) No. 1. The source of water for Grundy County PWSD No. 1 is the city of Trenton.

Health Assessment:

Records indicated that waste oils, wastewater treatment sludges, heavy metal sludges, paint sludges, solvents, and acid cleaning solutions were landfilled. High concentrations of metals were at one time identified in Muddy Creek. Based upon geologic and hydrologic investigations, downward movement of contaminants is not likely to occur.

Contaminants are most likely to move offsite by surface flow into Muddy Creek.

Investigation by the Missouri Department of Health and Senior Services revealed that no private wells exist within one mile of the site. The site, as it exists now, does not appear to present a significant threat to the health of the general public.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Union Carbide



Site Name: Union Carbide

Classification: Class 4

Date of Placement: December 12, 1996

Address: 317 West Florence Road, St. Joseph, Buchanan County, Missouri, SE 1/4, Sec. 19 T. 57N, R. 35W, St. Joseph South Quadrangle

Present Property Owner: Union Carbide Corporation

Lead Agency: DNR

Waste Type: 2,3,7,8-TCDD (dioxin), 2,4,5-T

Quantity: Not determined

Site Description:

In 1956, Amchem Products began operation of a herbicide formulation and metalworking products facility in St. Joseph on a parcel of 7.84 acres. Amchem formulated herbicides that primarily contained the active ingredients 2,4-D and 2,4,5-T. These formulations sometimes produced the unwanted byproduct dioxin. The facility ceased formulating these herbicides in 1975.

Soon thereafter, Union Carbide purchased the property and formulated other herbicides. In 1986, Rhone-Poulenc bought the herbicide formulation facility. The company acquired only the property (2.5 acres) that contained the facility. Union Carbide retained the remaining 5.34 vacant acres. In December 1997, Rhone-Poulenc sold the 2.5-acre property and facility to Nufarm Inc.

Contamination at the two properties dates from between 1956 and 1975 when herbicides containing dioxin were formulated. Spills near the rail siding contaminated the Nufarm Site. A lagoon used for disposal of waste from 1956 until 1975 on the property retained by Union Carbide is the source of contamination.

The Union Carbide Site is north of the Nufarm Site. Both properties are listed on the Registry. The Union Carbide Site is well-vegetated with grass and is enclosed by a 6-foot, chain-link fence with barbed wire around the top. The former lagoon area can only be accessed by crossing through the Nufarm property. The Missouri River is about 50 yards from the western boundary. Railroad tracks are situated between the site and the Missouri River. The site is located in a heavily industrialized area and access is controlled.

Environmental Problems and Areas of Concern Related to Site:

The site is located in the flood plain of the Missouri River, which is about 50 yards away.

Remedial Actions at Site:

A lagoon was used for disposal of wastes from 1956 until 1975. In 1975, the lagoon was drained and filled. Samples of the water from the lagoon taken prior to its closure revealed only traces of heavy metals and phenols. No further action was taken at that time.

A 1983 Resource Conservation and Recovery Act inspection by the department suggested that the lagoon be resampled. In 1986 the EPA conducted sampling of the former lagoon. Individual soil grab samples revealed concentrations of dioxin as high as 49 ppb at the surface. In 1988 Union Carbide contracted Pacific Environmental Services to conduct more extensive sampling. Dioxin was found as high as 16 ppb (0-6 inches) and 76 ppb (6-20 inches) in composite soil samples.

In December 1997, Union Carbide petitioned the department director for a change in site classification. In order to evaluate the Union Carbide claim, the department required further investigation and remediation. Union Carbide's Verification Sampling Plan was approved by the department. In October, 1998, Union Carbide conducted sampling. Three groundwater monitoring well samples and two sediment samples were collected and analyzed for 2,4-Dichlorophenoxyacetic acid; 2,4,5-Trichlorophenoxyacetic acid; Silvex (2,4,5-Trichlorophenoxypropionic acid) and dioxin. None of the sample results exceeded regulatory limits for any of the contaminants of concern. Therefore, the site was reclassified as a Class 3 site.

In June 2001, the Hazardous Waste Program approved a cap work plan submitted by Union Carbide Corporation. The remedial construction was completed in July 2002 and consisted of laying a drain pipe in the stormwater ditch on the east side, placing a compacted clay cap 1 to 2 feet thick over the contaminated area, placing a 10-foot wide

clay apron around the perimeter of the clay cap, and placing a 6 inch topsoil layer over the cap to support a vegetative cover. A fence was also moved to correspond with the southern property boundary. Union Carbide will provide ongoing maintenance and inspection of the cap and vegetative cover. Survey markers have been installed to delineate the cap, cap apron and buffer zones. Because of construction of the cap, the site was reclassified to a Class 4.

General Geologic and Hydrologic Setting:

The site is located on alluvium of the Missouri River floodplain. The 60- to 100-foot thick alluvium consists of low-permeability, fine-grained clay and silt at the surface, grading with depth to coarser sand and gravel units with high permeability. Sand units are encountered typically within 20 feet below grade, and the gravel seams are present nearer the alluvium/bedrock contact. Depth to the water table is 10 to 20 feet. The alluvial aquifer, which is an important source of water for local industry, is in direct hydraulic communication with the Missouri River.

Under normal flow conditions, groundwater beneath the site flows west toward the Missouri River. The site is subject to occasional flooding from the river. High river stages could reverse the groundwater flow direction. High-yield wells in the vicinity may also affect the direction of groundwater flow. Release of contaminants could affect the alluvial aquifer through direct infiltration.

The bedrock beneath the site is composed of Pennsylvanian-age limestones. Since the bedrock exhibits low permeability, release of contaminants would have minimal effect on the bedrock aquifer. Due to the mineralization of water within the bedrock, this aquifer is not used as a water source.

Public Drinking Water Advisory:

The site is downstream from St. Joseph's former drinking water river intake and the new drinking water well field. No other sources of public drinking water are in the area, and none should be affected by this site.

Health Assessment:

Soil samples collected in 1985 showed concentrations of 2,4-D; 2,4,5-T; and Silvex; as well as 2,3,7,8-TCDD (dioxin). The highest concentrations on the Union Carbide area were 2,4-D at 57.7 parts per million (ppm); 2,4,5-T at 19.2 ppm; Silvex at 7.4 ppm; and dioxin at 76 parts per billion. Dioxin is one of the most toxic substances known, although its toxicity varies greatly between species.

Animal studies have shown that dioxin produces acnegenic, fetotoxic, teratogenic, mutagenic, carcinogenic, and immunogenic effects. In humans, it is known to have an acnegenic effect (chloracne). It is also suspected to cause soft tissue sarcoma, non-

Hodgkin's Lymphoma, Hodgkin's disease, and porphyria cutanea tarda.

The site is located in an industrial area near the Missouri River. There are residential areas less than one-half mile southeast and less than a mile north. The site is fenced and the contamination is capped.

Based on the soil sample results and its proximity to another Registry site (NuFarm), a potential health risk exists at this site.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Wheeling Disposal



Site Name: Wheeling Disposal

Classification: Class 4

Date of Placement: January 1, 1984

Address: Along County Road K, about 1 mile southeast of Amazonia, Andrew County, Missouri, NE 1/4, Sec. 6, T. 58N, R. 35W, Savannah and St. Joseph North Quadrangles

Present Property Owner: Wheeling Disposal Service Company

Lead Agency: EPA

Waste Type: Pesticides, paint and tanning sludges, neutralized acids, metals, arsenic, and cyanide

Quantity: Estimated 4,662 cubic yards.

Site Description:

The site is near Amazonia in rural Andrew County. This entire site was a former municipal and industrial landfill that consists of two adjacent parcels of land totaling 200 acres. Wheeling Disposal Service Company began operating in the St. Joseph area in 1964. During the early 1970's, the company

opened a 10-acre area for industrial waste disposal. Industrial waste was accepted until May 1987. The site was covered with soil, graded and reseeded in 1987. Presently, the landfill is well-vegetated. The entrance to the landfill is posted with warning signs and secured with a locked gate and four-wire fence.

Environmental Problems and Areas of Concern Related to Site:

Large quantities of hazardous waste were buried in several cells at the site. Prior to installation of the remedy, the cells were not properly covered and leachate infiltration caused groundwater contamination. Although the remedy has effectively stopped infiltration, groundwater contamination will not be attenuated for many years.

Regulatory limits for various hazardous substances in groundwater were exceeded several times at several compliance points listed in the Record of Decision (ROD).

Contaminants could leave the site via groundwater or surface water originating from springs near the site.

Remedial Actions at Site:

The operator installed five groundwater monitoring wells along with a sixth, downgradient well. Through 1986, semi-annual water samples were collected, and analysis showed significant variations in aluminum and conductivity in two established wells. The owner formally closed the site in 1986.

Completed closure activities included the following:

1. Additional cover application and grading of the old sanitary landfill;
2. Final covering and contour grading of the special waste trench disposal area;
3. Filling and grading the former atrazine disposal impoundment. According to facility personnel, all the water evaporated from the impoundment before it was filled. No sludge or residual materials were extracted. Estimated depth of cover is 4 to 5 feet. The slope of the covered area is less than 3 percent;
4. All former special waste disposal trench areas, including the wire rope sludge pit, were covered with at least 4 feet of soil and graded to contour;
5. All areas which exhibited past significant erosion were filled and graded to contour with existing slopes;
6. All covered areas were terraced every 40 to 50 feet of vertical height (80 feet of vertical lift from the landfill base to the access road). Adequate drainage and slope has been established to provide enhanced runoff and minimize cover erosion.

In September 1988, six Responsible Parties (RPs) signed an Administrative Order to conduct a Remedial Investigation/Feasibility Study (RI/F). In May 1990, the RI was completed by the RPs. Results from groundwater monitoring conducted during the RI proved that shallow groundwater in the vicinity was contaminated with various volatile organic compounds. The RI also showed that shallow groundwater contamination has not migrated off site. Surface and subsurface soil sampling indicates slightly elevated levels of chromium.

The U.S. Environmental Protection Agency (EPA) completed a ROD in September 1990, which listed the following activities as necessary for remediating the site: (a) improved soil cover; (b) groundwater monitoring well system for shallow and deep segments of the aquifer; (c) site security; and (d) land use restrictions. In July 1991, five RPs signed a Consent Decree to implement the activities defined in the ROD. The RPs completed these activities in the summer of 1994.

Installation of a vinyl cover over most of the landfill cells and reestablishment of vegetative cover was completed in July 1994. Groundwater and surface water monitoring is ongoing.

The EPA ordered RPs to determine the consequences of newly identified contaminants found in unexpected areas. Additional response actions included a Geoprobe® groundwater investigation and inspection of ravines for groundwater discharge to surface water locations. The RP's consultant concluded that migration of contaminants will not affect nearby groundwater users since their well intakes end at higher elevations than the bottom of the ravines nearest to the waste cells. Although the ravines cut off contaminated groundwater migration, RPs will monitor the ravines in case of future contaminant migration to these areas. The EPA also required modification of the monitoring program to add a new groundwater well and several surface water locations.

The EPA completed a Five-Year Review in September 1999. Analytical results from groundwater and surface water monitoring conducted in May 1999 indicated that contamination has not migrated off site. Based on site inspection observations and the review of analytical sampling results, the remedy continues to be protective of human health and the environment. The trustees for the Wheeling Disposal Site submitted a "Five Year Historical Review Report and Proposed Annual Monitoring Program." The site was officially delisted from the National Priorities List (NPL) on October 30, 2000. Operations and Maintenance activities will be continued under a consent decree.

General Geologic and Hydrologic Setting:

On-site soils are composed of 50 to 70 feet of moderately permeable loess overlying glacial drift. The glacial drift varies from silty sand to sand. Boring information obtained near the site indicates water-bearing sand at depths of 27 to 38 feet below the surface.

Depth to bedrock at the site is highly variable, ranging from 100 to 200 feet below ground surface. The bedrock is composed principally of low-permeability shales and limestones.

The potential exists for downward migration of contaminants through the loess to the more permeable sand unit. Should such vertical migration occur, horizontal migration through the sand to off-site locations is possible. Contaminants may also migrate horizontally through the loess material, eventually discharging to surface water in nearby ravines.

Public Drinking Water Advisory:

The site is located within 1 to 2 miles of the wells for Amazonia and Savannah, which serve about 4,600 people. The wells, located in the Missouri River alluvium, are gravel-wall wells, 90 to 100 feet in depth. Depending on the hydrogeology of the area, the hazardous waste site may represent a threat to the alluvial aquifer.

Health Assessment:

The primary exposure pathway of concern is ingestion of contaminated ground and surface water. Surface drainage from the site occurs to the north into Mace Creek and to the south into a tributary of Dillon Creek. Groundwater from the site may also emerge as springs flowing into these streams. Monitoring has detected barium; cadmium; 1,1-dichloroethane; 1,2-dichloroethane; chloroform; ethylene dibromide; carbon tetrachloride; and trichloroethylene in one spring. Availability of public water has helped reduce the risk of significant human exposure from contaminated groundwater. Remedial activities performed in the summer of 1994

have reduced the potential for exposure, but contamination remains on site.

The following are the major contaminants of concern: aluminum, arsenic, barium, manganese, lead, sodium, benzoic acid, 2-butanone, 1,2-dichloroethane, 1,1,2-trichloroethane, ethylene, 1,1-dichloroethane, trichloroethylene, bis(2-ethylhexyl)phthalate, bromodichloromethane, carbon tetrachloride, chlorodibromomethane, chloroform, DDT, dieldrin, heptachlor, thimet, and toxaphene. Please refer to the Health Assessment Chemical Table in Appendix A for a description of the potential adverse health effects associated with these contaminants.

Samples collected by the EPA and the Missouri Department of Health and Senior Services (DHSS) in 1986 and 1987 found volatile organic compounds in one spring near the site. EPA samples contained concentrations of carbon tetrachloride, trichloroethylene, and 1,2-dichloroethane above 5,000 parts per billion (ppb). The DHSS samples also contained levels of metals above naturally-occurring levels. These, however, may have been from some other source, since illegal dumping has occurred in several areas nearby.

A small spring is located in the area that was used as a private drinking water source. This spring has, at times, contained levels of lead above the public drinking water standard. It is unknown if the lead is from Wheeling Disposal or some other source. This spring is no longer used as a drinking water source.

Based on available information, a health threat exists at this site. Off-site migration of wastes has occurred. However, results of recent samplings of private wells do not indicate contamination above maximum contaminant levels (MCLs).

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

Zykan Landfill



Site Name: Zykan Landfill

Classification: Class 4

Date of Placement: July 1, 1985

Address: Bob's Home Service, Inc., Route 1, Box 116F, Wright City, Warren County, Missouri, S 1/2, S 1/4, Sec. 32, T. 47N, R. 1W, Wright City Quadrangle

Present Property Owner: La Verne A. Zykan

Lead Agency: EPA

Waste Type: Inorganics, organics, heavy metals, paints, pigments, pesticides, and ignitable waste

Quantity: Not determined

Site Description:

The Zykan Landfill Site, which was formerly permitted as Bob's Home Service (BHS) Sanitary Landfill, is a closed sanitary waste disposal facility that operated from about 1971 to 1977. The landfill is located about 3 miles southwest of Wright City and is due

south of and contiguous to the closed BHS Hazardous Waste Landfill.

Between 1971 and 1977, materials disposed at the BHS Sanitary Landfill included miscellaneous trash, household garbage and unidentified industrial wastes. Since its closing, many of the suspected industrial wastes have been classified as hazardous substances. Some wastes disposed at the Zykan Site were determined to be similar to the wastes disposed at BHS. The wastes can be categorized as toxic pesticides, organic hydrocarbons, inorganics, heavy metals, paints, pigments, trihalomethanes and ignitable wastes.

Fire at the adjacent BHS Sanitary Landfill occurred in February 2002. Zykan Landfill was not affected by the fire. A storage building, waste tires and miscellaneous scrap and debris located just north of Zykan Landfill burned. About 50 to 100 tires and debris remain on site.

Environmental Problems and Areas of Concern Related to Site:

Unknown quantities of wastes remain buried on site. Past removal activities have eliminated surface water and groundwater

contamination via exposed wastes and leachate outbreaks. A good vegetative cover was established on the landfill's cap and slopes. Maintenance of the vegetative cover should prevent future erosional gullies and leachate outbreaks, thus eliminating future exposure and release of buried wastes to surface water and groundwater. The entire site is not enclosed by a fence, but the road into the site has a locked gate. A "No Trespassing" sign is posted.

Remedial Actions at Site:

From 1971 to 1977, the site operated as a sanitary and industrial landfill. This landfill was closed, capped and vegetated when the hazardous waste landfill began operation on July 8, 1977.

Post closure inspections revealed erosional problems and leachate outbreaks. Severe erosion was noted on the cap and southern slope. Leachate outbreaks, confined to the southern slope, were noted discharging into a tributary of Charrette Creek. During a May 1981 inspection, the leachate was sampled. Sampling revealed volatile organic compounds (VOCs), solvents, napthalene, and phenols in the leachate.

The EPA conducted an inspection in 1991, documenting the leachate outbreak and erosion. The EPA instructed the owners to correct these problems. Since no action was taken, the EPA issued a Notice of Violation (NOV) in November 1991.

In January 1992, the EPA referred this site to the Missouri Department of Natural Resources' St. Louis Regional Office (SLRO) Enforcement Section. Since the owner was not financially solvent, legal actions were not pursued.

From January 1992 through 1995, ongoing yearly closure site inspections revealed that no remedial actions were undertaken to correct the ongoing leachate outbreak and erosional gullies. The SLRO issued a Notice of Violation in June 1995. The department completed a Preliminary Assessment/Site Inspection on August 30, 1995.

The 1996 Registry inspection revealed exposed drums in a drainage ditch leading to Charrette Creek and a leachate outbreak on the south slope. The drums were overpacked. On August 30, 1996, the department completed an Integrated Preliminary Assessment/Site Inspection Report recommending an EPA Removal Action. Repairs were completed in late summer 1996. An Action Memorandum was signed on September 29, 1997, for a Time-Critical Removal Action. Field activities began October 1997 and were completed in February 1998. An Availability Session was held on November 13, 1997.

Wet weather conditions prevented the spring 1998 regrading and seeding. After regrading the areas disturbed during the removal, hydroseeding was conducted in the fall of 1998.

The EPA obtained a 12-month statutory exemption in January 1999 due to site maintenance and security problems. It was continued until April 2000. During that time, security was re-established with a new fence and gate system. Eroded gullies that had developed due to a lack of vegetation were repaired. The site was reseeded in the fall of 1999. The site is showing a good stand of vegetation, and no leachate seeps or erosional gullies are evident.

The EPA initiated an Expanded Site Investigation (ESI) in June 1997. The purpose of the ESI was to assess the threat the site posed to human health and the environment via surface water and groundwater. The ESI was completed on September 29, 1999. Due to previous removal activities, the ESI concluded that the site currently posed minimal or no threat to human health and the environment.

General Geologic and Hydrologic Setting:

The old landfill is located in an upland setting in the watershed of a tributary to Charrette Creek.

On-site soils are composed of 10 to 20 feet of loess overlying thick deposits of glacial drift. The upper 50 to 75 feet of drift is composed of

till, which is characterized by dense, low-permeability sandy and silty clay. This material is expected to provide an effective barrier to downward percolation of contaminants. Therefore, lateral leakage from the filled areas is the primary concern.

Because groundwater supplies within the glacial till are extremely limited, and because natural conditions are well suited for the prevention of groundwater contamination, drinking water supplies are not expected to be impacted significantly. Little likelihood of a significant groundwater release from this site exists.

Public Drinking Water Advisory:

Numerous public wells are within 3 miles of this site. The nearest well is 1 mile to the southwest and serves the East Central Missouri (ECM) Water & Sewer Authority. Other public systems nearby include a second well, which serves the ECM Water & Sewer Authority, Maple Ridge Mobile Home Park, Innsbrook Estates Subdivision, Valley Lake Estates, Oakview Estates, and Midway Mobile Home Park, and four wells that serve Wright City Child Evangelism School, and Glenbrook Estates.

Natural conditions are well-suited for the prevention of groundwater contamination; therefore, little likelihood of a significant groundwater release from this site exists.

Health Assessment:

Depending on the concentrations and amount of exposure, all the landfill wastes can

produce symptoms ranging from mild to severe, affecting virtually all systems of the body. Exposure to high concentrations for short periods usually produces acute symptoms that may be as mild as a rash or as severe as death. Exposure to low concentrations for prolonged periods of time usually produces chronic symptoms. These symptoms may also range from low levels of discomfort to severe irreversible damage and death.

The Missouri Department of Health and Senior Services is engaged in ongoing surveillance of private drinking water wells in the area surrounding the BHS-Zykan Sites. This surveillance has so far revealed no groundwater contamination. The latest round of sampling was conducted in May 2002. Based on the available information, no current exposure to hazardous substances exists at the Zykan Site. However, because of the unknown types and concentrations of hazardous substances possibly deposited at this site, a significant potential health risk must be presumed, as a potential exists for contaminants to migrate into the environment.

For more information regarding health-related issues, please contact the Missouri Department of Health and Senior Services, P. O. Box 570, Jefferson City, MO 65102, (573) 751-6404.

APPENDIX A
HEALTH ASSESSMENT
CHEMICAL TABLE

HEALTH ASSESSMENT CHEMICAL TABLE

CHEMICAL	POSSIBLE HEALTH EFFECTS
Acetone	Irritant to eyes, skin, and respiratory system. May cause dizziness and headache.
Alachlor (Lasso)	Probable human carcinogen; liver damage possible.
Aldrin	Potential carcinogen, animal teratogen. Attacks central nervous system (CNS), liver, kidneys, and skin.
Aluminum	Replaces calcium in bone, implicated in Alzheimer's disease.
Anthracene	Respiratory irritation and skin damage.
Antimony	Irritant of eyes and lungs; can cause heart problems, stomach pain and ulcers, diarrhea, vomiting; animal carcinogen.
Arsenic	Skin irritation; digestive system disturbances; known human carcinogen.
Atrazine	Possible human carcinogen; may cause heart, liver and peripheral nervous system damage.
Barium	Affects respiratory system, CNS.
Benzene	Known human carcinogen; animal carcinogen; suspected animal teratogen.
Benzo(a)anthracene	Probable human carcinogen.
Benzo(a)pyrene	Probable human carcinogen.
Benzo(b)fluoranthene	Probable human carcinogen.
Benzo(g,h,i)perylene	Insufficient data.
Benzo(k)fluoranthene	Probable human carcinogen.
3,4-Benzofluoranthene	Insufficient data.
Benzoic acid	Attacks eyes, skin, and mucous membranes.
Beryllium	Positive animal carcinogen, suspect human carcinogen. Attacks lungs, heart, liver, kidneys, spleen, skin, and eyes.
Beta-hexachlorocyclohexane	Possible human carcinogen.
Bis (2-ethylhexyl) phthalate	Positive animal and probable human carcinogen. Respiratory and gastrointestinal illness.
Bromodichloromethane	Suspected animal carcinogen; unknown health effects in man.
2-Butanone	Attacks the lungs and CNS.
Butyl benzyl phthalate	Insufficient data.
Cadmium	Suspected human carcinogen; attacks lungs, kidneys, and blood; produces teratogenic effects in animals.
Carbon Tetrachloride	Known animal carcinogen; suspect human carcinogen.
Chlordane	Positive animal carcinogen, probable human carcinogen. Attacks CNS, eyes, lungs, liver, kidneys, and skin.
Chlorobenzene	CNS depressant; attacks lungs, liver and kidneys.
Chlorodibromomethane	Unknown health effects in man.
Chloroform	Human carcinogen. Hepatic and renal damage, and central nervous system depressant.
Chromium	Respiratory system damage; liver and kidney effects; toxic effects vary with valence state; known human carcinogen.
Chrysene	Known animal carcinogen; suspected human carcinogen.
Cyanide	CNS depression. Digestive system disorders and cardiovascular system damage.
2,4-D	Weakness, stupor, hyporeflexia, muscle twitching, convulsions, and dermatitis.

CHEMICAL	POSSIBLE HEALTH EFFECTS
DDT/DDD/DDE	Suspect animal carcinogen, potential human carcinogen. Attacks nervous system, liver, kidneys, and skin.
Delta-hexachlorocyclohexane	Lung irritation; headache; convulsions.
Dibenz(a,h)anthracene	Probable human carcinogen.
1,2-Dichlorobenzene	Attacks liver, kidneys, skin, and eyes.
1,3-Dichlorobenzene	No known health effects.
1,4-Dichlorobenzene	Attacks liver, kidneys, eyes, skin, and respiratory system.
3,3-Dichlorobenzidine	Positive animal carcinogen; suspected human carcinogen.
1,1-Dichloroethane	CNS depressant; skin irritant; liver and kidney damage.
1,2-Dichloroethane	Central nervous system (CNS) depressant; digestive system disorders; respiratory and circulatory system damage; known animal carcinogen; suspected animal teratogen.
1,2-Dichloroethene	CNS depressant.
2,4-Dichlorophenol	Mild irritation of tissues and membranes.
Dieldrin	Potential carcinogen, animal teratogen. Attacks CNS, liver, kidneys, and skin.
Diethyl phthalate	Respiratory irritant; may cause dizziness, nausea, and eczema.
2,4-Dimethylphenol	Irritation of tissue and mucous membrane.
Di-n-butyl phthalate	Respiratory, mucous membrane, and dermal irritant.
Di-n-octyl phthalate	Suspected animal teratogen.
1,3-DNB (explosive)	Possible human carcinogen. CNS effects.
Endosulfan	Central nervous system damage.
Endrin	Potential carcinogen, animal teratogen. Attacks CNS and liver.
Ethyl benzene	Renal and hepatic disorders. Chronic respiratory and dermal disease.
Ethylene	Loss of coordination, unconsciousness, convulsions and paralysis.
Ethylene dibromide	Proven animal carcinogen.
Fluoranthene	Animal co-carcinogen.
Heptachlor	Positive animal carcinogen, potential human carcinogen. CNS and liver damage.
Heptachlor epoxide	Probable human carcinogen; CNS & liver damage.
Hexachlorobenzene	Weight loss, enlargement of the thyroid, skin sores, and discoloration.
Hexachlorophene	Proven animal carcinogen.
Isophorone	Central nervous system depressant; dermal and mucous membrane irritant.
Lead	Digestive system discomfort; muscular system weakness; CNS damage; affects blood and liver.
Lindane (Gamma-hexachlorocyclohexane)	Possible human carcinogen.
Manganese	Affects respiratory system, CNS, blood, lungs, kidneys; known animal teratogen.
Mercury	Attacks CNS, kidneys, respiratory tract, skin, and gingival tissue.
Methoxychlor	CNS depressant, nausea, headache.
Methylene Chloride	CNS depressant; cardiovascular irregularities; known animal carcinogen.
Naphthalene	Vision loss; bladder irritation; erythrocyte destruction.
Nickel	CNS depressant; respiratory system damage; liver and kidney effects; known animal carcinogen; suspected animal teratogen; suspected human carcinogen.
P-chloro-m-cresol	Insufficient data.

CHEMICAL	POSSIBLE HEALTH EFFECTS
<i>Pentachlorophenol</i>	Irritation to skin, eyes, respiratory system; possible damage to liver and kidney.
<i>Phenanthrene</i>	Suspected animal carcinogen.
<i>Phenol</i>	Skin and eye damage; affects the digestive system, CNS, liver, and kidneys.
<i>Polychlorinated biphenyls</i>	Animal carcinogen; suspected human carcinogen; hepatotoxin and embryotoxin.
<i>Polycyclic Aromatic Hydrocarbons (PAHs)</i>	Some are positive animal carcinogens and suspect human carcinogens.
<i>Pyrene</i>	Known animal, suspected human carcinogen.
<i>RDX (explosive) 1,3,5-trinitro-1,3,5-triazine</i>	CNS effects, such as seizures; nausea and vomiting; Possible human carcinogen.
<i>Selenium</i>	Liver and kidney damage.
<i>Sodium</i>	Increases blood pressure.
<i>Styrene</i>	Irritant to eyes, skin, and respiratory system. CNS depressant. Animal carcinogen.
<i>2,4,5-T</i>	Weakness, malaise, loss of appetite, and heart failure.
<i>2,3,7,8-Tetrachlorodibenzo-para-dioxin (2,3,7,8-TCDD, or Dioxin)</i>	Chloracne; thymic atrophy; liver damage. Suspected to cause soft tissue sarcoma, Non-Hodgkin's Lymphoma, porphyria cutanea tarda, and Hodgkin's disease.
<i>1,1,2,2-Tetrachloroethane</i>	Attacks CNS, blood, liver, and kidneys.
<i>Tetrachloroethylene (PCE)</i>	Central nervous system depressant, and positive animal carcinogen. Hepatotoxin; renal injury.
<i>Thimet</i>	Attacks CNS.
<i>Toluene</i>	Central nervous system depressant; liver and kidney damage.
<i>Toxaphene</i>	Proven animal carcinogen; attacks the skin and CNS.
<i>1,1,1-Trichloroethane</i>	Proven animal carcinogen; CNS depressant, attacks liver and kidneys.
<i>1,1,2-Trichloroethane</i>	CNS depressant.
<i>Trichloroethylene (TCE)</i>	CNS depressant; renal and hepatic damage; known animal carcinogen.
<i>Trifluralin (Treflan)</i>	Possible human carcinogen.
<i>Vinyl chloride</i>	Human carcinogen; CNS depressant.
<i>Xylenes</i>	CNS depressant; liver and kidney damage.
<i>Zinc</i>	Some forms may be carcinogenic and/or affect the peripheral nervous system. All may cause gastrointestinal distress.

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APPENDIX B

GLOSSARY OF

HEALTH TERMS

GLOSSARY OF HEALTH TERMS

acnegenic

Producing or increasing the severity of acne.

aplastic anemia

A rare but extremely serious disorder that results from the unexplained failure of the bone marrow to produce blood cells.

carcinogenic or carcinogen

Capable of causing cancer. A suspected carcinogen is a substance that may cause cancer in humans or animals but for which the evidence is not conclusive.

central nervous system (CNS)

Brain and spinal cord.

chloracne

A rare acne-like skin condition caused by exposure to herbicides or chlorinated chemicals, including the dioxins. It develops a few months after swallowing, inhaling or touching the responsible agent.

cholinesterase

An enzyme produced in the liver that is required for normal nervous function.

conjunctiva

The membrane that lines the eyelids and covers the white part, or sclera, of the eyeball. When an individual has conjunctivitis, the reflection of the inflamed conjunctiva makes the white of the eye appear red.

cutaneous

Of, relating to, or affecting the skin.

embryotoxicity and fetotoxicity

Any toxic effect on the embryo (embryotoxicity) or fetus (fetotoxicity) as a result of prenatal exposure to a substance that crosses the placental barrier. The distinguishing feature between the two terms is the stage of development during which the insult occurs. Toxic effects can include malformations and variations, altered growth, and in utero death.

fetotoxicity

See "embryotoxicity."

genotoxicity

Damaging to DNA or pertaining to agents (radiation or chemical substances) known to damage DNA, thereby causing mutations or cancer.

gingival tissue

Gum tissue.

hepatic

Of, relating to, affecting, or associated with the liver.

Hodgkin's disease

One of the two basic types of lymphoma, Hodgkin's is a cancer that develops in the lymphatic system, the part of the body's circulatory system that helps fight disease and infection.

hyperpigmentation

An increase in the natural color of the skin.

hyporeflexia

Underactivity of bodily reflexes.

immunity

The ability of an organism to resist disease or toxins by natural or artificial means.

immunogenic

Producing immunity or evoking an immune response. An immunological effect is the production of a functional change in the immune response. Immunologic toxicity causes the occurrence of adverse effects on the immune system and may result from exposure to environmental agents such as chemicals.

keratosis

A disease of the skin marked by growth of scaly tissue.

lymphoma

Any of various malignant tumors that arise in the lymph nodes or in other lymphoid tissue.

mesothelioma

A malignant tumor of the mesothelium. The mesothelium is the thin lining on the surface of the body cavities and the organs that are contained within them.

morbidity

The rate of incidence of a disease.

mutagen

A substance that causes mutations. A mutation is a change in the DNA sequence contained in a cell. Mutations can lead to birth defects, miscarriages, or cancer.

mutagenic

Causing alteration in the DNA (genes or chromosomes) of an organism.

natality

The ratio of total live births to total population in a specified area over a specified period of time; birthrate.

narcosis

A condition of deep stupor or unconsciousness produced by a drug or other chemical substance.

non-Hodgkins lymphoma

A group of malignancies, with differing patterns of behavior and responses to treatment, in which cancer (malignant) cells are found in the lymph system.

osteosarcoma

A sarcoma derived from bone or containing bone tissue; also called osteogenic sarcoma.

peripheral neuritis

General classification of disorders involving damage or destruction of nerves, not including the nerves of the brain or spinal cord (CNS).

pneumonitis

A disease characterized by inflammation of the lungs.

porphyria cutanea tarda

The most common form of porphyria, causes blistering of skin exposed to sunlight. Porphyrias are a group of disorders caused by deficiencies of enzymes involved in the synthesis of heme, a chemical compound that carries oxygen and makes blood red.

pulmonary edema

A condition in which fluid accumulates in the lungs, usually because the heart's left ventricle does not pump adequately.

renal

Relating to, involving, affecting, or located in the region of the kidneys.

sarcoma

Cancerous growth of the soft tissues.

teratogenic

Capable of causing abnormal development of the embryo and congenital malformations.

teratogenicity

The ability or tendency to produce anomalies of formation.

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APPENDIX C

MISSOURI HAZARDOUS

WASTE MANAGEMENT LAW

(Selected Sections)

A complete version of the Missouri Revised Statutes Chapter 260, Environmental Control, is available at the Missouri General Assembly's Internet address: www.moga.state.mo.us/statutes/chapters/chap260.htm.

Missouri Revised Statutes
Chapter 260
Environmental Control

Hazardous Waste Management

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August 28, 2001

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Missouri Revised Statutes
Chapter 260
Environmental Control

August 28, 2000

Section 260.350-Short title.

Sections 260.350 to 260.430 shall be known and may be cited as the "Missouri Hazardous Waste Management Law".

(L. 1977 H.B. 318 § 1)

Section 260.355-Exempted wastes.

Exempted from the provisions of sections 260.350 to 260.480 are:

- (1) Radioactive wastes regulated under section 2011, et seq., of title 42 of United States Code;
- (2) Emissions to the air subject to regulation of and which are regulated by the Missouri air conservation commission pursuant to chapter 643, RSMo;
- (3) Discharges to the waters of this state pursuant to a permit issued by the Missouri clean water commission pursuant to chapter 204, RSMo;
- (4) Fluids injected or returned into subsurface formations in connection with oil or gas operations regulated by the Missouri oil and gas council pursuant to chapter 259, RSMo;
- (5) Mining wastes used in reclamation of mined lands pursuant to a permit issued by the Missouri land reclamation commission pursuant to chapter 444, RSMo.

(L. 1977 H.B. 318 § 2, A.L. 1985 S.B. 110)

Effective 6-27-85

Section 260.360-Definitions.

When used in sections 260.350 to 260.430 and in standards, rules and regulations adopted pursuant to sections 260.350 to 260.430, the following words and phrases mean:

- (1) "Cleanup", all actions necessary to contain, collect, control, treat, disburse, remove or dispose of a hazardous waste;
- (2) "Commission", the hazardous waste management commission of the state of Missouri created by sections 260.350 to 260.430;
- (3) "Conference, conciliation and persuasion", a process of verbal or written communications consisting of meetings, reports, correspondence or telephone conferences between authorized representatives of the department and the alleged violator. The process shall, at a minimum, consist of one offer to meet with the alleged violator tendered by the department. During any such meeting, the department and the alleged violator shall negotiate in good faith to eliminate the alleged violation and shall attempt to agree upon a plan to achieve compliance;
- (4) "Department", the Missouri department of natural resources;
- (5) "Detonation", an explosion in which chemical transformation passes through the material faster than the speed of sound, which is 0.33 kilometers per second at sea level;
- (6) "Director", the director of the Missouri department of natural resources;
- (7) "Disposal", the discharge, deposit, injection, dumping, spilling, leaking, or placing of any waste

into or on any land or water so that such waste, or any constituent thereof, may enter the environment or be emitted into the air or be discharged into the waters, including groundwaters;

(8) "Final disposition", the location, time and method by which hazardous waste loses its identity or enters the environment, including, but not limited to, disposal, resource recovery and treatment;

(9) "Generation", the act or process of producing waste;

(10) "Generator", any person who produces waste;

(11) "Hazardous waste", any waste or combination of wastes, as determined by the commission by rules and regulations, which, because of its quantity, concentration, or physical, chemical or infectious characteristics, may cause or significantly contribute to an increase in mortality or an increase in serious irreversible, or incapacitating reversible, illness, or pose a present or potential threat to the health of humans or the environment;

(12) "Hazardous waste facility", any property that is intended or used for hazardous waste management including, but not limited to, storage, treatment and disposal sites;

(13) "Hazardous waste management", the systematic recognition and control of hazardous waste from generation to final disposition including, but not limited to, its identification, containerization, labeling, storage, collection, transfer or transportation, treatment, resource recovery or disposal;

(14) "Infectious waste", waste in quantities and characteristics as determined by the department by rule and regulation, including the following wastes known or suspected to be infectious: isolation wastes, cultures and stocks of etiologic agents, contaminated blood and blood products, other contaminated surgical wastes, wastes from autopsy, contaminated laboratory wastes, sharps, dialysis unit wastes, discarded biologicals and antineoplastic chemotherapeutic materials; provided, however, that infectious waste does not mean waste treated to department specifications;

(15) "Manifest", a department form accompanying hazardous waste from point of generation, through transport, to final disposition;

(16) "Minor violation", a violation which possesses a small potential to harm the environment or human health or cause pollution, was not knowingly committed, and is not defined by the United States Environmental Protection Agency as other than minor;

(17) "Person", an individual, partnership, copartnership, firm, company, public or private corporation, association, joint stock company, trust, estate, political subdivision or any agency, board, department or bureau of the state or federal government or any other legal entity whatever which is recognized by law as the subject of rights and duties;

(18) "Resource recovery", the reclamation of energy or materials from waste, its reuse or its transformation into new products which are not wastes;

(19) "Storage", the containment or holding of waste at a designated location in such manner or for such a period of time, as determined in regulations adopted hereunder, so as not to constitute disposal of such waste;

(20) "Treatment", the processing of waste to remove or reduce its harmful properties or to contribute to more efficient or less costly management or to enhance its potential for resource recovery including, but not limited to, existing or future procedures for biodegradation, concentration, reduction in volume, detoxification, fixation, incineration or neutralization;

(21) "Waste", any material for which no use or sale is intended and which will be discarded or any material which has been or is being discarded. "Waste" shall also include certain residual materials, to be specified by the rules and regulations, which may be sold for purposes of energy or materials reclamation, reuse or transformation into new products which are not wastes;

(22) "Waste explosives", any waste which has the potential to detonate, or any bulk military propellant which cannot be safely disposed of through other modes of treatment.

(L. 1977 H.B. 318 § 3, A.L. 1980 2d Ex. Sess. H.B. 5, et al., A.L. 1985 S.B. 110, A.L. 1986 H.B. 875 & 1649, A.L. 1987 H.B. 375, A.L. 1993 S.B. 80, et al.)

Section 260.365-Hazardous waste management commission created--composition, qualifications--compensation--terms--meetings, notice required, quorum.

1. There is hereby created a hazardous waste management agency to be known as the "Hazardous Waste Management Commission of the State of Missouri", whose domicile for the purpose of

sections 260.350 to 260.430 shall be deemed to be that of the department of natural resources of the state of Missouri. The commission shall consist of seven members appointed by the governor with the advice and consent of the senate. No more than four members shall belong to the same political party. All members shall be representative of the general interest of the public and shall have an interest in and knowledge of waste management and the effects of improper waste management on health and the environment and shall serve in a manner consistent with the purposes of sections 260.350 to 260.430. Three of the members, but no more than three, one for each interest, shall be knowledgeable of and may be employed in agriculture, the waste generating industry and the waste management industry. Except for the industry members, no member shall receive, or have received during the previous two years, a significant portion of income directly or indirectly from any license or permit holder or applicant for license or permit under any waste management act. At the first meeting of the commission and annually thereafter, the members shall select from among themselves a chairman and a vice chairman. Prior to any vote on any variance, appeal or order, they shall adopt a voting rule to exclude from such vote any member with a conflict of interest with respect to the matter at issue.

2. The members' terms of office shall be four years and until their successors are selected and qualified, except that, of those first appointed, three shall have a term of three years, two shall have a term of two years and two shall have a term of one year as designated by the governor at the time of appointment. There is no limitation on the number of terms any appointed member may serve. If a vacancy occurs the governor may appoint a member for the remaining portion of the unexpired term created by the vacancy. The governor may remove any appointed member for cause. The members of the commission shall be reimbursed for actual and necessary expenses incurred in the performance of their duties, and shall receive fifty dollars per day for each day spent in the performance of their official duties while in attendance at regular commission meetings.

3. The commission shall hold at least four regular meetings each year and such additional meetings as the chairman deems desirable at a place and time to be fixed by the chairman. Special meetings may be called by three members of the commission upon delivery of written notice to each member of the commission. Reasonable written notice of all meetings shall be given by the department to all members of the commission. Four members of the commission shall constitute a quorum. All powers and duties conferred upon members of the commission shall be exercised personally by the members and not by alternates or representatives. All actions of the commission shall be taken at meetings open to the public. Any member absent from four consecutive regular commission meetings for any cause whatsoever shall be deemed to have resigned and the vacancy shall be filled immediately in accordance with this section.

(L. 1977 H.B. 318 § 4, A.L. 1980 2d Ex. Sess. H.B. 5, et al.)

Effective 10-31-80

Section 260.370-Duties and powers of commission--rules and regulations to be adopted, procedures--inspection fees, use of, refund, when--variances granted, when.

1. Where proven technology is available and the economic impact is reasonable, pursuant to rules and regulations promulgated by the commission, the hazardous waste management commission shall encourage that every effort is made to effectively treat, recycle, detoxify, incinerate or otherwise treat hazardous waste to be disposed of in the state of Missouri in order that such wastes are not disposed of in a manner which is hazardous to the public health and the environment. Where proven technology is available with respect to a specific hazardous waste and the economic impact is reasonable, pursuant to rules and regulations promulgated by the commission, the hazardous waste management commission shall direct that disposal of the specific hazardous wastes using land filling as the primary method is prohibited.

2. The hazardous waste management commission shall, by rules and regulations, categorize hazardous waste by taking into account toxicity, persistence and degradability in nature, potential for accumulation in tissue, and other related factors such as flammability, corrosiveness and other

hazardous characteristics. The commission shall by rules and regulations further establish within each category the wastes which may or may not be disposed of through alternative hazardous waste management technologies including, but not limited to, treatment facilities, incinerators, landfills, landfills, storage facilities, surface impoundments, recycling, reuse and reduction. The commission shall specify, by rule and regulation, the frequency of inspection for each method of hazardous waste management and for the different waste categories at hazardous waste management sites. The inspection may be daily when the hazardous waste management commission deems it necessary. The hazardous waste management commission shall specify, by rule, fees to be paid to the department by owners or operators of hazardous waste facilities who have obtained, or are required to obtain, a hazardous waste facility permit and who accept, on a commercial basis for remuneration, hazardous waste from off-site sources, but not including wastes generated by the same person at other sites located in Missouri or within a metropolitan statistical area located partially in Missouri and owned or operated by the same person and transferred to the hazardous waste facility, for treatment, storage or disposal, for inspections conducted by the department to determine compliance with sections 260.350 to 260.430 and the regulations promulgated thereunder. Funds derived from these inspection fees shall be used for the purpose of funding the inspection of hazardous waste facilities, as specified in subsection 3 of section 260.391. Such fees shall not exceed twelve thousand dollars per year per facility and the commission shall establish a graduated fee scale based on the volume of hazardous waste accepted with reduced fees for facilities accepting smaller volumes of hazardous waste. The department shall furnish, upon request, to the person, firm or corporation operating the hazardous waste facility a complete, full and detailed accounting of the cost of the department's inspections of the facility for the twelve-month period immediately preceding the request within forty-five days after receipt of the request. Failure to provide the accounting within forty-five days shall require the department to refund the inspection fee paid during the twelve-month-time period.

3. In addition to any other powers vested in it by law, the commission shall have the following powers:

- (1) From time to time adopt, amend or repeal, after due notice and public hearing, standards, rules and regulations to implement, enforce and carry out the provisions of sections 260.350 to 260.430 and any required of this state by any federal hazardous waste management act and as the commission may deem necessary to provide for the safe management of hazardous wastes to protect the health of humans and the environment. In implementing this subsection, the commission shall consider the variations within this state in climate, geology, population density, quantities and types of hazardous wastes generated, availability of hazardous waste facilities and such other factors as may be relevant to the safe management of hazardous wastes. Within two years after September 28, 1977, the commission shall adopt rules and regulations including the following:
 - (a) Rules and regulations establishing criteria and a listing for the determination of whether any waste or combination of wastes is hazardous for the purposes of sections 260.350 to 260.430, taking into account toxicity, persistence and degradability in nature, potential for accumulation in tissue, and other related factors such as flammability, corrosiveness and other hazardous characteristics;
 - (b) Rules and regulations for the storage, treatment and disposal of hazardous wastes;
 - (c) Rules and regulations for the transportation, containerization and labeling of hazardous wastes, which shall be consistent with those issued by the Missouri public service commission;
 - (d) Rules and regulations establishing standards for the issuance, modification, suspension, revocation or denial of such licenses and permits as are consistent with the purposes of sections 260.350 to 260.430;
 - (e) Rules and regulations establishing standards and procedures for the safe operation and maintenance of hazardous waste facilities in order to protect the health of humans and other living organisms;
 - (f) Rules and regulations listing those wastes or combinations of wastes, for which criteria have been established under paragraph (a) of this subdivision and which are not compatible and which may not be stored or disposed of together;
 - (g) Rules and regulations establishing procedures and requirements for the reporting of the generation, storage, transportation, treatment or disposal of hazardous wastes;

(2) Adopt and publish, after notice as required by the provisions of chapter 536, RSMo, pertaining to administrative rulemaking, and public hearing, a state hazardous waste management plan to provide for the safe and effective management of hazardous wastes within this state. This plan shall be adopted within two years after September 28, 1977, and revised at least once every five years thereafter;

(3) Hold hearings, issue notices of hearings and subpoenas requiring the attendance of witnesses and the production of evidence, administer oaths and take testimony as the commission deems necessary to accomplish the purposes of sections 260.350 to 260.430 or as required by any federal hazardous waste management act. Unless otherwise specified in sections 260.350 to 260.430, any of these powers may be exercised on behalf of the commission by any members thereof or a hearing officer designated by it;

(4) Grant individual variances in accordance with the provisions of sections 260.350 to 260.430;

(5) Make such orders as are necessary to implement, enforce and effectuate the powers, duties and purposes of sections 260.350 to 260.430.

4. No rule or portion of a rule promulgated under the authority of sections 260.350 to 260.480 and sections 260.565 to 260.575 shall become effective unless it has been promulgated pursuant to the provisions of section 536.024, RSMo.

(L. 1977 H.B. 318 § 5, A.L. 1980 2d Ex. Sess. H.B. 5, et al., A.L. 1988 S.B. 535, A.L. 1993 S.B. 52 merged with S.B. 80, et al., A.L. 1995 S.B. 3)

Section 260.371-Severability clause, exceptions.

The provisions of this act* are severable, except as otherwise provided in sections 260.225 and 260.370. If any provision of this act* is found by a court of competent jurisdiction to be invalid or unconstitutional, the remaining provisions of this act shall remain in full force and effect.

(L. 1988 S.B. 535 § 3)

Effective 5-3-88

*"This act" (S.B. 535, 1988) contained numerous sections. Consult Disposition of Sections table for a definitive listing.

Section 260.372-Powers and duties of commission.

1. The Missouri hazardous waste management commission within the Missouri department of natural resources is hereby given the authority to aid in the promotion of hazardous waste recycling, reuse, or reduction by entering into contracts, subject to appropriations, for the development and implementation of projects dealing with said uses of hazardous wastes or the purchase and development of machinery, equipment, appliances, devices, and supplies solely required to develop and operate hazardous waste recycling, reuse, and reduction projects.

2. The hazardous waste management commission within the Missouri department of natural resources shall promulgate rules and regulations to establish or participate in one or more regional waste exchange clearing houses where generators of wastes may list those wastes that have market value or other use.

(L. 1980 2d Ex. Sess. H.B. 5, et al.)

Effective 10-31-80

Section 260.400-Procedure for conducting public hearings.

1. At public hearings on variances or appeals of decisions hereunder, all hazardous waste facilities and hazardous waste generators who are involved in such hearings shall have an appropriate person present. All testimony taken before the commission shall be under oath and recorded stenographically. The transcript so recorded, upon payment of the usual charge therefore, shall be

made available to any member of the public, the respondent or party to a hearing on a complaint, any party to a hearing on a petition for variance or any party appealing any order or determination of the department or commission.

2. In any hearing, any member of the commission or the hearing officer shall issue in the name of the commission notice of hearing and subpoenas and shall be authorized to require that testimony before such hearing be given under oath. Subpoenas shall be issued and enforced as provided in section 536.077, RSMo. The rules of discovery that apply in any civil case shall apply to hearings held by the commission.

3. All hearings to adopt standards, rules and regulations, or to adopt the state hazardous waste management plan shall be held before at least four members of the commission. All other hearings may be held before one commission member designated by the commission chairman or by a hearing officer who shall be a member of the Missouri bar and shall be appointed by the commission chairman. The hearing officer or commission member shall preside at the hearing and hear all evidence and rule on the admissibility of evidence. The hearing officer or commission member shall make recommended findings of fact and may make recommended conclusions of law to the commission.

4. All final orders or determinations or other final actions by the commission shall be approved in writing by at least four members of the commission. Any commission member approving in writing any final action of the commission, who did not attend the hearing, shall do so only after reviewing all exhibits and reading the entire transcript.

5. The following requirements shall apply to the adoption, amendment and repeal of standards, rules and regulations:

(1) No standard, rule or regulation or any amendment or repeal thereof shall be adopted except after a public hearing to be held after thirty days prior notice as required by the provisions of chapter 536, RSMo, pertaining to administrative rulemaking and by press release or public advertisement containing the date, time and place of the hearing and opportunity given to the public to be heard;

(2) At the hearing, opportunity to be heard by the commission with respect to the subject thereof shall be afforded any interested person upon written request to the commission, addressed to the department, not later than seven days prior to the hearing, and may be afforded to other persons if convenient. In addition, any interested persons, whether or not heard, may submit, within seven days subsequent to the hearings, a written statement of their views. The commission may solicit the views, in writing, of persons who may be affected by, knowledgeable concerning or interested in proposed standards, rules and regulations, the state hazardous waste management plan or any license, permit or variance. Any person heard or represented at the hearing or making written request for notice shall be given written notice of the action of the commission with respect to the subject thereof;

(3) Any standard, rule or regulation, amendment or repeal thereof or state hazardous waste management plan shall not be deemed adopted or in force until it has been approved in writing by at least four members of the commission.

(L. 1977 H.B. 318 § 11, A.L. 1980 2d Ex. Sess. H.B. 5, et al., A.L. 1993 S.B. 52)

Section 260.435-Definitions, sections 260.435 to 260.480--definition of hazardous waste not to include certain materials.

The definitions set forth in section 260.360 shall apply to sections 260.435 to 260.480 and, in addition to such definitions, the term "abandoned or uncontrolled" means any property where hazardous waste has been illegally disposed of, or where hazardous waste was disposed of prior to regulation under sections 260.350 to 260.430. However, the term "hazardous waste" as used in sections 260.350 to 260.480 shall not include:

- (1) Fly ash waste, bottom ash waste, slag waste and flue gas emission control waste generated primarily from the combustion of coal or other fossil fuels;
- (2) Solid waste from the extraction, beneficiation and processing of ores and minerals, including phosphate rock and overburden from the mining of uranium ore; or
- (3) Cement kiln dust waste; unless any such waste becomes subject to regulation under the Federal

Hazardous Waste Management Act, then such waste excluded under this section shall be subject to regulation under this act*.

(L. 1983 H.B. 528)

Effective 6-27-83

*"This act" (H.B. 528, 1983) contained numerous sections. Consult Disposition of Sections table for a definitive listing.

Section 260.437-Rules and regulations, authority.

In addition to any other powers vested in it by law, the commission shall have the power to adopt, amend or repeal, after due notice and public hearing, standards, rules and regulations to implement sections 260.435 to 260.480.

(L. 1983 H.B. 528, A.L. 1995 S.B. 3)

Section 260.440-Registry of abandoned or uncontrolled hazardous waste sites, contents--investigation--department's powers and duties.

1. The department shall maintain and make available for public inspection a registry of confirmed abandoned or uncontrolled hazardous waste disposal sites in the state. The department shall take all necessary action to insure that the registry provides a complete listing of all such sites. The registry shall contain the exact location of each site and identify the types of waste found at each site.
2. The department shall investigate all known or suspected abandoned or uncontrolled sites and determine whether each site should be included in the registry. In the evaluation of known or suspected abandoned or uncontrolled sites, the department shall have the power to enter private property and perform tests and analyses in the manner provided in section 260.375.

(L. 1983 H.B. 528)

Effective 6-27-83

Section 260.445-Abandoned and uncontrolled sites, annual report, content--sent to whom.

1. The department shall, on or before January 1, 1984, and annually thereafter on January first of each succeeding year, transmit an updated report to the commission, the general assembly and the governor identifying every abandoned or uncontrolled hazardous waste disposal site in the state listed on the registry. A copy of such report shall also be sent to the governing body of every county containing such a site.
2. Each annual report shall include, but need not be limited to, the following information for each site:
 - (1) A general description of the site, including the name and address of the site, the type and quantity of the hazardous waste disposed of at the site and the name of the current owners of the site;
 - (2) A summary of any significant environmental problems at and near the site;
 - (3) A summary of any serious health problems in the immediate vicinity of the site and any health problems deemed by the department to be related to conditions at the site;
 - (4) The status of any testing, monitoring or remedial actions in progress or recommended by the department;
 - (5) The status of any pending legal actions and any federal, state or local government permits concerning the site;
 - (6) The relative priority for remedial action at each site; and
 - (7) The proximity of the site to private residences, public buildings or property, school facilities,

places of work or other areas where individuals may be regularly present.

3. In developing and maintaining the annual report, the department shall assess by January 1, 1984, and reassess by January first of each year thereafter based upon new information received, the relative priority of the need for action at each site to remedy environmental and health problems resulting from the presence of hazardous wastes at such sites. In making its assessments of relative priority, the department shall place every site in one of the following classifications:

- (1) Causing or presenting an imminent danger of causing irreversible or irreparable damage to the public health or environment--immediate action required;
- (2) Significant threat to the environment--action required;
- (3) Does not present a significant threat to the public health or environment--action may be deferred;
- (4) Site properly closed--requires continued management;
- (5) Site properly closed, no evidence of present or potential adverse impact--no further action required.

4. Any site classified as properly closed under subdivision (5) of subsection 3 of this section shall be removed from all subsequent annual reports and the register of abandoned or uncontrolled sites.

5. The department shall utilize the department of health and senior services when assessing the effects of an abandoned or uncontrolled site on human health.

(L. 1983 H.B. 528)

Effective 6-27-83

Section 260.446-Accounting on remedial fund, content--sent to whom.

The department shall, on or before January 1, 1985, and annually thereafter on January first of each succeeding year, render a full accounting of moneys received, moneys expended, sources and recipients, and purposes for the preceding fiscal year in the hazardous waste remedial fund to the commission, the general assembly and the governor.

(L. 1983 H.B. 528)

Effective 6-27-83

Section 260.450-Priority of sites, listed in registry, determined by investigation -- factors to be considered.

1. The director shall investigate each site listed in the registry to determine the relative priority of the site as provided in section 260.445.

2. The director shall for each site identify the:

- (1) Address and site boundaries;
- (2) Time period of use for disposal of hazardous waste;
- (3) Name of the current owner and operator and names of reported owners and operators during the time period of use for disposal of hazardous waste;
- (4) Names of persons responsible for the generation and transportation of hazardous waste disposed of; and
- (5) Type, quantity and manner of hazardous waste disposal.

3. When preliminary evidence suggests further assessment is necessary, the director may assess the:

- (1) Depth of water table at the site;
- (2) Nature of soils at the site;
- (3) Location, nature and size of aquifers at the site;

- (4) Direction of present and historic groundwater flows at the site;
- (5) Location and nature of surface waters at and near the site;
- (6) Levels of contaminants, if any, in groundwater, surface water, air and soils at and near the site resulting from hazardous wastes disposed of at the site; and
- (7) Current quality of all drinking water drawn from or distributed through the area in which the site is located, if the department determines that water quality may have been affected by the site.

4. The director shall maintain a site assessment file for each site listed in the registry. The file shall contain all information obtained pursuant to this section and shall be open to the public. The site materials in the file may be reproduced by any person. The department may impose a charge not to exceed the actual cost of reproduction for copies of file information.

(L. 1983 H.B. 528)

Effective 6-27-83

Section 260.455-Registry, proposed site addition, procedure, notice.

Within sixty days after June 27, 1983, the department shall notify by certified mail the owner of all or any part of each site or area to be included in the registry required by section 260.440 by mailing notice to the owner's last known address. Thereafter, thirty days before any site is added to the registry, the department shall notify the owner of all or any part of such site by certified mail of the proposed addition to the registry by mailing notice to each such owner at the owner's last known address.

(L. 1983 H.B. 528)

Effective 6-27-83

Section 260.460-Listing or proposed listing of site in registry, procedure to remove.

1. Any owner or operator of a site proposed for listing in the registry, or listed in the registry pursuant to section 260.440, may petition the director for deletion of such site, modification of the site classification or modification of any information regarding such site. No site shall be listed on the registry until after the resolution of any appeal initiated under this section.
2. Within ninety days after the submittal of such petition, the commission may convene a hearing to review the action of the director. No less than thirty days prior to the hearing, the commission shall cause a notice of hearing to be published in a newspaper of general circulation in the county in which the site is located. The commission shall also notify in writing any owner or operator of the site no less than thirty days prior to the hearing.
3. No later than thirty days following receipt of the complete record or following the decision not to hold a hearing, the commission shall provide the owner or operator with a written determination accompanied by reason therefor regarding action taken on the petition. All final decisions of the commission shall be reviewable under chapter 536, RSMo.
4. The department shall, within ten days of any determination, notify the local governments of jurisdiction whenever a change is made in the registry pursuant to this section.

(L. 1983 H.B. 528)

Effective 6-27-83

Section 260.465-Change of use or transfer of site property--notice to buyer--appeal -- violations, penalty.

1. No person may substantially change the manner in which an abandoned or uncontrolled hazardous waste disposal site on the registry prepared and maintained by the department pursuant

to section 260.440 is used without the written approval of the director.

2. No person may sell, convey or transfer title to an abandoned or uncontrolled hazardous waste disposal site which is on the registry prepared and maintained by the department pursuant to section 260.440 without disclosing to the buyer early in the negotiation process that the site is on the registry, specifying applicable use restrictions and providing all registry information for the site. The seller shall also notify the buyer that he may be assuming liability for any remedial action at the site; provided, however, the sale, conveyance or transfer of property shall not absolve any person responsible for site contamination, including the seller, of liability for any remedial action at the site. The seller shall notify the department of the transfer of ownership within thirty days after the transfer.
3. Decisions of the director concerning the use of an abandoned or uncontrolled hazardous waste site may be appealed to the commission in the manner provided in section 260.460.
4. If the department has reason to believe that the provisions of this section have been violated, or are in imminent danger of being violated, it may institute a civil action in any court of competent jurisdiction for injunctive relief to prevent such violation and for the assessment of a civil penalty not to exceed one thousand dollars per day for each day of violation.

(L. 1983 H.B. 528, A.L. 1988 S.B. 535)

Section 260.470-Recording of sites, placed on or removed from registry.

When the director places a site on the registry as provided in section 260.440, and after the resolution of any appeal under section 260.455, he shall file with the county recorder of deeds the period during which the site was used as a hazardous waste disposal area. When the director finds that a site on the registry has been properly closed under subdivision (5) of subsection 3 of section 260.445 with no evidence of potential adverse impact, he shall file this finding with the county recorder of deeds. The county recorder of deeds shall file this information so that any purchaser will be given notice that the site has been placed on, or removed from, the registry.

(L. 1983 H.B. 528)

Effective 6-27-83

Section 260.475-Fees to be paid by hazardous waste generators--exceptions--fee distribution--violations, penalty--deposit--fee requirement, expiration.

1. Every hazardous waste generator shall pay, in addition to the fees imposed in section 260.380, a fee of twenty-five dollars per ton annually on all hazardous waste which is discharged, deposited, dumped or placed into or on the soil as a final action, and two dollars per ton on all other hazardous waste transported off site. No fee shall be imposed upon any hazardous waste generator who registers less than ten tons of hazardous waste annually pursuant to section 260.380, or upon:
 - (1) Hazardous waste which must be disposed of as provided by a remedial plan for an abandoned or uncontrolled hazardous waste site;
 - (2) Fly ash waste, bottom ash waste, slag waste and flue gas emission control waste generated primarily from the combustion of coal or other fossil fuels;
 - (3) Solid waste from the extraction, beneficiation and processing of ores and minerals, including phosphate rock and overburden from the mining of uranium ore and smelter slag waste from the processing of materials into reclaimed metals;
 - (4) Cement kiln dust waste;
 - (5) Waste oil; or
 - (6) Hazardous waste that is:
 - (a) Reclaimed or reused for energy and materials;
 - (b) Transformed into new products which are not wastes;
 - (c) Destroyed or treated to render the hazardous waste nonhazardous; or
 - (d) Waste discharged to a publicly owned treatment works.
2. The fees imposed in this section shall be reported and paid to the department on an annual basis

not later than the first of January. The payment shall be accompanied by a return in such form as the department may prescribe.

3. Sixty percent of all moneys collected or received by the department pursuant to this section shall be transmitted to the department of revenue for deposit in the state treasury to the credit of the hazardous waste remedial fund created in section 260.480. Forty percent of all moneys collected or received by the department pursuant to this section shall be transmitted to the department of revenue for deposit in the state treasury to the credit of the hazardous waste fund created pursuant to section 260.391. Following each annual reporting date, the state treasurer shall certify the amount deposited in the fund to the commission.

4. If any generator or transporter fails or refuses to pay the fees imposed by this section, or fails or refuses to furnish any information reasonably requested by the department relating to such fees, there shall be imposed, in addition to the fee determined to be owed, a penalty of fifteen percent of the fee, sixty percent of which shall be deposited in the hazardous waste remedial fund, and forty percent of which shall be deposited in the hazardous waste fund.

5. If the fees or any portion of the fees imposed by this section are not paid by the date prescribed for such payment, there shall be imposed interest upon the unpaid amount at the rate of ten percent per annum from the date prescribed for its payment until payment is actually made, sixty percent of which shall be deposited in the hazardous waste remedial fund, forty percent of which shall be deposited in the hazardous waste fund.

6. The state treasurer is authorized to deposit all of the moneys in the hazardous waste remedial fund in any of the qualified depositories of the state. All such deposits shall be secured in such a manner and shall be made upon such terms and conditions as are now or may hereafter be provided for by law relative to state deposits. Interest received on such deposits shall be credited to the hazardous waste remedial fund.

*7. No fee shall be collected pursuant to this section after January 1, 2005.

(L. 1983 H.B. 528, A.L. 1985 S.B. 110, A.L. 1988 S.B. 535, A.L. 1994 H.B. 1156, A.L. 1999 S.B. 353, A.L. 2000 S.B. 577)

*Fee expires 1-1-05

Section 260.479-Commission to establish subdivisions of waste based on management, fees charged against generators-limits on certain fees-exceptions -- fee distribution--expires, when.

1. The hazardous waste management commission shall establish, by rule, two subdivisions of hazardous waste based upon the management method. Subdivision A shall include waste which is placed in a hazardous waste disposal facility or which is stored for a period of more than one hundred eighty days; provided, however, for the purposes of this section, the commission may identify hazardous waste which shall be taxed pursuant to subdivision A when stored for longer than ninety days as well as waste which may be stored for up to one year and taxed as provided in subdivision B below. Subdivision B shall include all other hazardous waste produced. The director shall annually request that a minimum of one million dollars be appropriated from general revenue funds for deposit in the hazardous waste remedial fund created pursuant to section 260.480.

2. Except as provided in this subsection and subsection 5 of this section, each hazardous waste generator registered with the department of natural resources, except the state and any political subdivision thereof, shall pay a fee based on the volume of waste produced in each of the subdivisions A and B as follows:

(1) For subdivision A waste, the fee shall be equal to 0.90785 times the amount of waste in short tons times the following sum: twenty-one dollars and eighty cents plus the product of 7.9890 cents times the amount of waste in short tons, except that the fee for subdivision A waste shall not exceed eighty thousand dollars; and

(2) For subdivision B waste, the fee shall be equal to 0.90785 times the amount of waste in short

tons times the following sum: ten dollars and ninety cents plus the product of 3.9945 cents times the amount of waste in short tons, except that the fee for subdivision B waste shall not exceed forty thousand dollars.

No company shall pay more than eighty thousand dollars annually pursuant to this subsection; provided that all fee amounts established pursuant to this subsection may be adjusted annually by the commission by an amount not to exceed two and fifty-five hundredths percent. No individual generator subject to a fee pursuant to this section shall pay less than fifty dollars annually.

3. No tax shall be imposed pursuant to this section upon hazardous waste generators whose waste consists solely of waste oil or facilities licensed pursuant to chapter 197, RSMo. The commission may exempt intermittent generators or generators of very small volumes of hazardous waste from payment of fees required pursuant to this section, provided those generators comply with all other applicable provisions of sections 260.360 to 260.430.

4. Any hazardous waste generator registered with the department which discharges waste to a publicly owned treatment works having an approved pretreatment program as required by chapter 204, RSMo, shall not pay any fee required in sections 260.350 to 260.550 on such waste discharged which is in compliance with pretreatment requirements. The hazardous waste management commission may exempt such generators from the provisions of sections 260.350 to 260.430 if such exemption will not be in violation of the federal Resource Conservation and Recovery Act.

5. No fee shall be imposed pursuant to this section upon any hazardous waste which must be disposed of as provided by a remedial plan for an abandoned or uncontrolled hazardous waste site, or upon smelter slag waste from the processing of materials into reclaimed metals. Fees on hazardous waste fuel produced from hazardous waste by processing, blending or other off-site treatment shall be assessed and collected only at the facility where such hazardous waste fuel is utilized as a substitute for other fuel. No facility using hazardous waste fuel shall pay more than eighty thousand dollars annually pursuant to this subsection for the first fiscal year fees are assessed pursuant to this section, and such maximum amount may be adjusted annually thereafter by the commission by an amount not to exceed two and fifty-five hundredths percent. This subsection shall not be construed to apply to hazardous waste used directly as a fuel that has not been processed, blended, or otherwise treated off site. Such waste shall be subject to the fees established in subsection 2 of this section.

6. The department may establish by rule and regulation categories of waste based upon waste characteristics pursuant to subsection 2 of section 260.370. When the commission adopts hazardous waste categories, it shall establish and annually revise a fee schedule based upon waste characteristics. Each generator shall annually pay a fee, in lieu of the fee required in subsection 2 of this section, based upon the volume of waste produced annually within each hazard category.

7. All fees within this section shall be based on hazardous waste produced within the preceding state fiscal year beginning with July first of the year this section goes into effect and payable at the end of the calendar year on December thirty-first and annually thereafter in the same manner; provided that no liability for fees shall be accrued pursuant to subsection 5 of this section for any waste used as a fuel prior to August 28, 2000.

8. The department shall promptly transmit sixty percent of all funds collected pursuant to this section to the director of revenue for deposit in the hazardous waste remedial fund created pursuant to section 260.480. The department shall promptly transmit forty percent of all funds collected pursuant to this section to the director of revenue for deposit in the hazardous waste fund created pursuant to section 260.391.

*9. Notwithstanding any other provision of law to the contrary, no tax based on the number of employees employed by a hazardous waste generator shall be collected. No tax or fee shall be levied pursuant to this section after January 1, 2005.

(L. 1985 S.B. 110, A.L. 1988 S.B. 535, A.L. 1989 H.B. 44, A.L. 1994 H.B. 1156, A.L. 1999 S.B. 353, A.L. 2000 S.B. 577)

*Fee expires 1-1-05

Section 260.480-Hazardous waste remedial fund established--uses of fund--no transfer to general revenue, exception.

1. There is hereby created within the state treasury a fund to be known as the "Hazardous Waste Remedial Fund". All moneys received from fees, penalties, general revenue, federal funds, gifts, bequests, donations, or any other moneys so designated shall be deposited in the state treasury to the credit of such fund, and shall be invested to generate income to the fund. Notwithstanding the provisions of section 33.080, RSMo, the unexpended balance in the hazardous waste remedial fund at the end of each fiscal year shall not be transferred to the general revenue fund except as directed by the general assembly by appropriation to replace funds appropriated from the general revenue fund for the purposes for which expenditures from the hazardous waste remedial fund are allowed.
2. The department may use the fund, upon appropriation, for the nonfederal share and any other expenditures which are not covered pursuant to the federal Comprehensive Environmental Response, Compensation and Liability Act of 1980, for the following purposes:
 - (1) Administrative services as appropriate and necessary for the identification, assessment and cleanup of abandoned or uncontrolled sites pursuant to sections 260.435 to 260.550;
 - (2) Payments to other state agencies for such services consistent with sections 260.435 to 260.550, upon proper warrant issued by the commissioner of administration, including, but not limited to, the department of health and senior services for the purpose of conducting health studies of persons exposed to waste from an uncontrolled or abandoned hazardous waste site or exposed to the release of any hazardous substance as defined in section 260.500;
 - (3) Acquisition of property as provided in section 260.420;
 - (4) The study of the development of a hazardous waste facility in Missouri as authorized in section 260.037;
 - (5) Financing the nonfederal share of the cost of cleanup and site remediation activities as well as postclosure operation and maintenance costs, pursuant to the federal Comprehensive Environmental Response, Compensation and Liability Act of 1980; and
 - (6) Reimbursement of owners or operators who accept waste pursuant to departmental orders pursuant to subdivision (2) of subsection 1 of section 260.420.
3. Neither the state of Missouri nor its officers, employees or agents shall be liable for any injury caused by a dangerous condition at any abandoned or uncontrolled site unless such condition is the result of an act or omission constituting gross negligence on the part of the state, its officers, employees or agents.
4. The department may contract with any person to perform the acts authorized in this section.
5. No moneys shall be available from the fund for abandoned site cleanup unless the director has made all reasonable efforts to secure voluntary agreement to pay the costs of necessary remedial actions from owners or operators of abandoned or uncontrolled hazardous waste sites or other responsible persons.
6. The director shall make all reasonable efforts to recover the full amount of any funds expended from the fund through litigation or cooperative agreements with responsible persons. All moneys recovered or reimbursed pursuant to this section through voluntary agreements or court orders shall be deposited with the state treasurer and credited to the account of the hazardous waste remedial fund.

(L. 1983 H.B. 528, A.L. 1985 S.B. 110, A.L. 1988 S.B. 535, A.L. 2000 S.B. 577)

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APPENDIX D

MISSOURI HAZARDOUS

WASTE MANAGEMENT

REGULATIONS

10 CSR 25-10.010

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Rules of
Department of Natural Resources
Division 25—Hazardous Waste
Management Commission
Chapter 10—Abandoned or Uncontrolled
Hazardous Waste Disposal Sites

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**Title 10—DEPARTMENT OF
NATURAL RESOURCES**
Division 25—Hazardous Waste
Management Commission
Chapter 10—Abandoned or Uncontrolled
Hazardous Waste Disposal Sites

10 CSR 25-10.010 Abandoned or Uncontrolled Hazardous Waste Disposal Sites

PURPOSE: This rule establishes procedures for adding sites to, removing sites from and modifying site classifications in the Missouri Registry of Confirmed Abandoned or Uncontrolled Hazardous Waste Disposal Sites and establishes procedures to be used by responsible parties to obtain state approval for remedial actions at abandoned or uncontrolled sites.

(1) Proposing Sites for the Registry.

(A) When the department proposes to list a site on the registry, it will notify each owner of record of the site of the proposal. Notice shall be given by certified mail directed to the last known address of the person being notified.

1. The notice shall contain a general description of the site proposed to be listed on the registry, a general description of the nature of the waste found at the site and a statement that the owner or operator may request a hearing before the commission in accordance with section (2) of this rule regarding the proposal by filing a notice of appeal by certified mail with the director within thirty (30) days of the notice.

(B) No abandoned or uncontrolled site may be listed on the registry until the notice set forth in this subsection has been given and any timely appeal to the commission has been finally resolved. If an owner or operator does not file a notice of appeal within the time specified in paragraph (1)(A)1. of this rule, the department will list the site on the registry as proposed.

(2) Appeals to the Commission.

(A) Within the ninety (90) days following the filing of a timely notice of appeal, the commission may convene a hearing, or refer the matter to a hearing officer or handle any pretrial matters that comes before it. After hearing, or upon receipt of the recommendation of the hearing officer, and after any briefing or argument of the parties, the commission shall issue its findings of fact, conclusions of law and order affirming, modifying or reversing, in whole or in part, the action or proposed action of the department or director, and giving the appellant any relief warranted under the circumstances.

1. In any hearing under this rule, the provisions of sections 260.400.2–260.400.4, RSMo shall apply.

2. In any hearing under this rule, any party may move the commission for summary judgment upon the same procedure and terms as in a motion filed pursuant to Rule 74.04, Missouri Rules of Civil Procedure. If the matter has been referred to a hearing officer, the hearing officer shall recommend to the commission a proposed order upon the motion.

(B) No hearing shall be held under this rule upon less than thirty (30) days' written notice to the appellant. In addition, the department, at least thirty (30) days prior to the hearing, shall publish in a newspaper of general circulation in the county in which the site is located, a notice of the date and place of the hearing.

(C) The parties to a hearing shall be the appellant, the department and any person who upon proper motion shall be allowed to intervene in the proceeding. The granting or denial of a motion to intervene shall be governed by the considerations set forth in Rule 52.12, Missouri Rules of Civil Procedure. In any matter before a hearing officer, the hearing officer shall rule on any motion to intervene.

(D) Within ten (10) days after the rendition of any decision by the director or the commission to make any change in the registry, the department will notify by mail the local governments with jurisdiction over the site of any change.

(E) Opportunity to Allow Responsible Party Cleanups.

1. Within thirty (30) days of notice under section (1) of this rule, a responsible party may commit in writing to investigate the site and implement an approved remedial action.

2. A consent agreement developed under this section must be signed by the department and the responsible party and must contain, but not be limited to, the following commitments:

A. A schedule and specific responsibilities for completion of any site investigation and remedial action;

B. The responsible party will obtain departmental approval before implementation of any remedial action;

C. The responsible party shall be responsible for off-site migration;

D. The responsible party shall reimburse the department for all response and oversight costs incurred by the department.

3. In the case that either party to the consent agreement refuses or fails to carry out the terms of the agreement, either party

may request a hearing before the commission on the matter to be handled as an appeal to the commission under section (2) of this rule.

4. Remedial actions undertaken at a site according to terms of a consent agreement developed under this section must include all necessary actions to achieve a classification pursuant to paragraph (7)(B)5. of this rule in order for the department to withdraw its proposed listing of the site on the registry.

5. When the department determines that a remedial action results in a site receiving a classification of 1, 2, 3, or 4 pursuant to subsection (7)(B) of this rule, the department will notify each owner and the party to the consent agreement developed under this section. This notification will be according to procedures established in section (1) of this rule and will include the classification of the site pursuant to subsection (7)(B) of this rule.

(3) Change of Use or Transfer of Site Property.

(A) No person may substantially change the manner in which a site listed on the registry is used without the prior written approval of the director.

1. Requests for approval for changes in use must be submitted in writing to the director at least sixty (60) days prior to any planned substantial change in use.

2. The request must include a detailed site description, a detailed description of the change in use planned and an analysis concerning whether the change in use might result in any of the conditions described in subparagraph (3)(A)4.A. through D. of this rule. Any plans, specifications or designs prepared for the change in use shall be submitted to the director with the request.

3. The director will evaluate the request to determine whether the change in use is substantial. If the change in use is not substantial, the director will notify the owner that departmental approval is not required.

4. If the director determines that the change in use is a substantial change, the request will be evaluated to determine whether the change in use may result in any of the following:

A. A spread of contamination over additional portions of the site or off-site;

B. An increase in human exposure to the hazardous materials;

C. An increase in adverse environmental impacts; or

D. A situation making potential remedial actions to correct problems at the site more difficult to undertake or complete.

5. Requests for changes in use which may result in conditions described in subparagraphs (3)(A)4.A. through D., of this

rule will be denied by the director. Requests which do not result in any of the conditions in subparagraphs (3)(A)4.A. through D., of this rule will be approved.

(B) No person may sell, convey or transfer title to an abandoned or uncontrolled hazardous waste disposal site which is on the registry prepared and maintained by the department pursuant to section 260.440, RSMo without disclosing to the buyer early in the negotiation process that the site is on the registry.

1. Prior to the execution of any contracts for sale, conveyance or transfer of title to a site which is on the registry, the seller shall provide to the buyer a copy of the letter from the department notifying the owner of the department's intent to list the property on the Registry of Confirmed Abandoned or Uncontrolled Hazardous Waste Disposal Sites in Missouri.

2. Prior to the execution of any contracts for sale, conveyance or transfer of title to a site which is listed on the registry, the seller shall provide to the buyer a copy of the letter from the department notifying the owner that the property has been listed on the Registry of Confirmed Abandoned or Uncontrolled Hazardous Waste Disposal Sites in Missouri along with any applicable use restrictions and other registry information for the site.

3. The seller, within thirty (30) days after the transfer of title, shall notify the department in writing of the transfer. At that time the seller shall also provide to the department a notarized statement signed by the buyer which states that the buyer has received and read the information specified in paragraphs (3)(B)1. and 2. of this rule and that the buyer understands that s/he may be assuming liability for any remedial action at the site; provided, however, the sale, conveyance or transfer of property shall not absolve any person responsible for site contamination, including the seller, of liability for any remedial action at the site.

(C) Decisions of the director concerning requests for a change in use of a site on the registry may be appealed to the commission. Any appeals filed under this part will be handled according to the procedures in section (2) of this rule.

(4) Recording of Sites, Listing Them On or Removing Them From the Registry.

(A) When the director lists a site on the registry as provided in section 260.440, RSMo, s/he shall file with the recorder of deeds of the county where the site, or each portion of the site, is located a notice describing the site so that the notice will appear in the chain of title of the site, and stating the

period during which the site was used as a hazardous waste disposal site, the hazardous waste(s) for which the site is being listed, and that the site has been listed on the Registry of Confirmed Abandoned or Uncontrolled Hazardous Waste Disposal Sites. The notice shall be recorded and indexed in the manner which is provided for deeds of real property.

(B) When the director finds that a site listed on the registry has been properly closed under paragraph (7)(B)5. of this rule, s/he shall file with the county recorder of deeds a notice that the site has been removed from the Registry of Confirmed Abandoned or Uncontrolled Hazardous Waste Disposal Sites. The notice shall describe the site so that the notice will appear in the chain of title of the site and shall be recorded and indexed in the same manner as the notice filed under subsection (4)(A) of this rule.

(5) Petitions for Deletion From the Registry, Change in Site Classification or Modification of Information.

(A) The record owner of any portion of a site listed on the registry, or any operator of any portion of the site, may petition the director of the department in writing by certified mail to delete the site from the registry, to modify the site classification or to modify information included in the registry, annual report, site assessment file or filed with the county recorder of deeds. The petition shall state the interests of the petitioner in the site and shall state what relief the petitioner is requesting, and shall contain a summary of the factual and legal reasons why the petitioner believes the requested relief is warranted.

1. The director shall investigate the matters raised in the petition and shall respond in writing within thirty (30) days to the petitioner, stating his/her decision whether and to what extent the relief requested is or is not granted or shall request information or site accesses pursuant to paragraph (5)(A)2. of this rule. The response shall be sent by certified mail to the address of the petitioner or his/her attorneys as shown on the petition.

2. The director may request additional information from the petitioner, and access to the site, in order to evaluate the merits of the petition. Failure to provide the requested information or site access within thirty (30) days shall be grounds for denial of the petition.

3. The petitioner may appeal to the commission any decision by the director upon a petition under section (5) of this rule, by filing a written notice of appeal by certified mail with the commission's staff director within thirty (30) days of the director's final

response to the petition. If a timely notice of appeal is not filed under this paragraph, no issue determined by the director adverse to the petitioner may be considered as grounds for relief in any subsequent petition by the same person, or by any person in privity with the person, in any subsequent petition under section (5) of this rule.

(6) Survey of Sites to Reduce the Area to be Listed or Already Listed on the Registry.

(A) The owner or a responsible party may submit to the department in writing a commitment to survey the site and reduce the area to be or which has been listed on the registry.

1. For sites which have been proposed for listing on the registry, the written commitment to survey the site must be received within thirty (30) days of notice under section (1) of this rule or within thirty (30) days of the commission's decision pursuant to section (2) of this rule. In no event may a survey for this purpose be accepted beyond one hundred twenty (120) days of the department's receipt of written commitment pursuant to subsection (6)(A) of this rule.

2. If the owner or a responsible party chooses to reduce the area of the site, a written commitment to do so under subsection (6)(A) of this rule must include the instructions or plan to be given the surveyor describing the area to be surveyed.

3. The plan or instructions must be approved by the department prior to implementation.

4. The surveyor must install permanent survey markers at the corners of the surveyed area.

5. The site must include a one hundred foot (100') minimum buffer zone extending laterally in all directions from the known edge of the contamination, either on or below the ground surface. The dimensions of the buffer zone may be modified upon approval of the department.

6. The owner or a responsible party must submit to the department a survey sealed by a land surveyor, who is registered to practice in Missouri and in compliance with the current Minimum Standards for Property Boundary Surveys in 10 CSR 30-2.010 depicting the legal description of the site.

(B) (Reserved)

(7) Site Assessment.

(A) Site Assessment Committee.

1. A five (5)-member voting committee shall be established with one qualified representative each from the Missouri Department of Health; the department's Division of



Geology and Land Survey; and one (1) representative each from the Division of Environmental Quality's Hazardous Waste Program, Public Drinking Water Program and one (1) other environmental program. Three (3) yes votes are required to initially classify or reclassify a site.

2. The committee shall meet at least once annually to assess or reassess the classification of each abandoned or uncontrolled hazardous waste registry site as required in section 260.445.3, RSMo. The classification shall be determined in accordance with criteria contained in subsection (7)(B) of this rule.

(B) Classifications and Criteria for Determining Site Classifications.

1. Class 1—sites that are causing or presenting an imminent danger of causing irreversible or irreparable damage to the public health or environment. Sites present a high risk to public health and/or the environment, and the following criteria for determining this site classification shall apply:

A. Hazardous waste on the site is highly concentrated and readily accessible by ingestion and/or inhalation and/or dermal contact; and/or

B. Immediate remediation or action is required to prevent irreparable damage to public health and/or the environment.

2. Class 2—sites that are a significant threat to the environment. Sites present a moderate risk to public health and/or the environment, and the following criteria for determining this site classification shall apply:

A. Hazardous waste on the site exhibits one (1) or more of the following:

(I) Moderately concentrated and accessible by ingestion and/or inhalation and/or dermal contact;

(II) Highly concentrated, but not openly accessible due to the nature of the site and the contamination and/or any remedial action taken; and

(III) Likely to adversely impact human health and/or the environment if not treated.

B. Remediation or action is required to reduce adverse impacts to public health and/or the environment.

3. Class 3—sites that do not present a significant threat to the public health or environment. Sites present a low risk to public health and/or the environment, and the following criteria for determining this site classification shall apply:

A. Hazardous waste on the site exhibits one (1) or more of the following:

(I) Low to moderately concentrated and are not readily accessible by ingestion and/or inhalation and/or dermal contact due

to the nature of the site and the contamination and/or any remedial action taken; and

(II) Exceeding established regulatory guidelines; however, are not significantly impacting public health and/or the environment at this time.

B. Action may be deferred; however, hazardous waste remains on-site, and remediation is needed.

4. Class 4—sites that have been properly closed. All department required response actions have been implemented on the sites, and the response actions have been approved by the department. The following criteria for determining this site classification shall apply:

A. Hazardous waste remains on-site; and

B. The site requires continued treatment, containment, or other operation and maintenance until it meets established regulatory guidelines.

5. Class 5—sites that have been properly closed with no evidence of present or potential adverse impact. Sites proposed for the registry or on the registry meet all department requirements and regulatory guidelines for a residential or industrial cleanup as defined in subparagraphs (7)(B)5.A. and B. of this rule.

A. Residential cleanup.

(I) A site is remediated to standards determined on a site-specific basis by the department in consultation with the Missouri Department of Health, considering toxicity and typical residential exposure factors which may include years of exposure, body weight, exposure dose and/or other risk factors.

(II) A site is cleaned up for the hazardous wastes identified and remediated, and the site is not placed on the registry, or may be removed from the registry. A letter may be sent to the landowner authorizing residential use of the site. The county recorder of deeds shall be notified of the removal of a site from the registry.

B. Industrial/commercial cleanup.

(I) A site is—

(a) Remediated to standards determined on a site-specific basis by a method approved by the department in consultation with the Department of Health which considers toxicity and typical industrial exposure factors which may include years of exposure, body weight, exposure dose and/or other risk factors;

(b) Used only for industrial or commercial purposes as long as any remaining hazardous wastes exceed the department's residential or any-use standards; and

(c) Not a source for off-site releases of contaminants in concentrations

exceeding residential or any-use standards for any media.

(II) A consent agreement, as defined in subsection (2)(E), shall be signed by the department and the property owner which establishes a schedule and specific responsibilities for completion of a site investigation and remedial action.

(a) The property owner shall—

I. Comply with the terms of the consent agreement; and
II. Continue to comply with the terms of the consent agreement.

(b) The consent agreement shall contain the requirement that the property owner file a deed restriction with the recorder of deeds in the county in which the site is located. One (1) or more of the following deed restrictions shall be filed so as to appear on the chain of title for the site, along with any other restrictions specific to the site:

I. Prohibiting the construction or placement of potable water wells on the property without the approval of the Missouri Department of Natural Resources;

II. Prohibiting excavation or construction work in areas of known soil contamination without the approval of the Missouri Department of Natural Resources;

III. Prohibiting the disruption or alteration of a cap, containment system or barrier in an area of known contamination without the approval of the Missouri Department of Natural Resources; and/or

IV. Prohibiting the property from being used for anything but an industrial use.

(III) The deed restriction and consent agreement are required before a site is withdrawn from the registry, or before a proposal to list a site is withdrawn.

(IV) The property owner must provide the department with evidence that the property owner has notified the political subdivision exercising jurisdiction over land use planning of the proposed industrial/commercial cleanup level classification.

(C) When the department proposes to initially classify or reclassify a site on the registry in accordance with criteria contained in subsection (7)(B) of this rule, it will notify each owner of record of the proposed site classification.

1. The notice shall contain the classification being proposed by the site assessment committee and a statement that the owner or operator may petition the director of the department in accordance with subsection (5)(A) of this rule and appeal the director's final decision in accordance with section 260.460, RSMo and this rule.

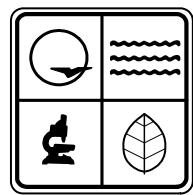
2. If an owner or operator does not file a notice of appeal within thirty (30) days of the mailing date of the notice specified in paragraph (7)(C)1. of this rule, the department will classify the site on the registry as proposed.

3. No registry classification or reclassification may be made until the notice set forth in subsection (7)(C) of this rule has been mailed, and any appeal to the commission in accordance with section (2) of this rule has been finally resolved.

4. Pending petitions or appeals of registered sites pursuant to subsection (5)(A) of this rule will not prevent the site from being listed in the annual report. Appeals to the commission under subsection (5)(A) of this rule will be noted in the annual report.

AUTHORITY: sections 260.370, 260.437, 260.440, 260.445 and 260.455, RSMo Supp. 2000.* Original rule filed Aug. 14, 1984, effective March 1, 1985. Amended: Filed March 28, 1986, effective Oct. 1, 1986. Amended: Filed Sept. 1, 1987, effective Dec. 25, 1987. Amended: Filed Sept. 6, 1988, effective Jan. 1, 1989. Amended: Filed Feb. 16, 1990, effective Dec. 31, 1990. Amended: Filed Jan. 15, 1991, effective Aug. 1, 1991. Amended: Filed June 1, 1998, effective Jan. 30, 1999. Amended: Filed Feb. 1, 2001, effective Oct. 30, 2001.

*Original authority: 260.370, RSMo 1977, amended 1980, 1988, 1993, 1995; 260.437, RSMo 1983, amended 1995; 260.440, RSMo 1983; 260.445, RSMo 1983; and 260.455, RSMo 1983.



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